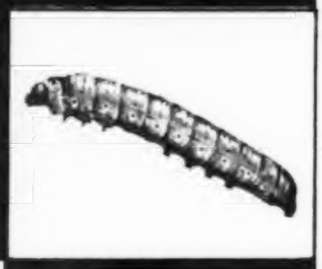
AGRICULTURAL CHEMICALS

A MONTHLY MAGAZINE FOR MANUFACTURERS, PROCESSORS AND DISTRIBUTORS

COLORADO POTATO BEETLE—costs potato growers an estimated $16,500,000 a year*



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**Department of Agriculture—Entomology and Plant Quarantine, 1938. Last figures available.*

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AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

Indicative of day and night agricultural activity in the nation's effort to raise more food, this spray-duster outfit is applying tartar emetic-sugar treatment for control of citrus thrips. Both treatment and equipment developed by entomologists at California Citrus Experiment station. (Photo by John Brenneis)

AUGUST, 1946
VOL. 1 NO. 4

In This Issue:

Editorials 13
Guest Editorial 14
By Allen B. Lemmon
Cooperative Grasshopper Control 15
By Claude Wakeland
Sabadilla 19
By Carl H. Krieger
Use of Copper as a Fungicide 22
By L. Gordon Utter
Vegetable Seed Treatments 25
By Paul R. Miller
Tree Wound Dressings 26
By Milton A. Lesser
Early DDT Research in Europe 29
By R. C. Roark
Comments 33
By Dr. A. J. Cox
Listening Post 35
By Paul Miller and G. J. Haeussler
Suppliers' Bulletins 39
Fertilizer Outlook 41
By Clifton A. Woodrum
Market Report 45
Technical Briefs 46
Industry News 51
Classified Advertisements 61
Trade Marks 63
Industry Patents 64
Advertisers' Index 65
Tale Ends 66

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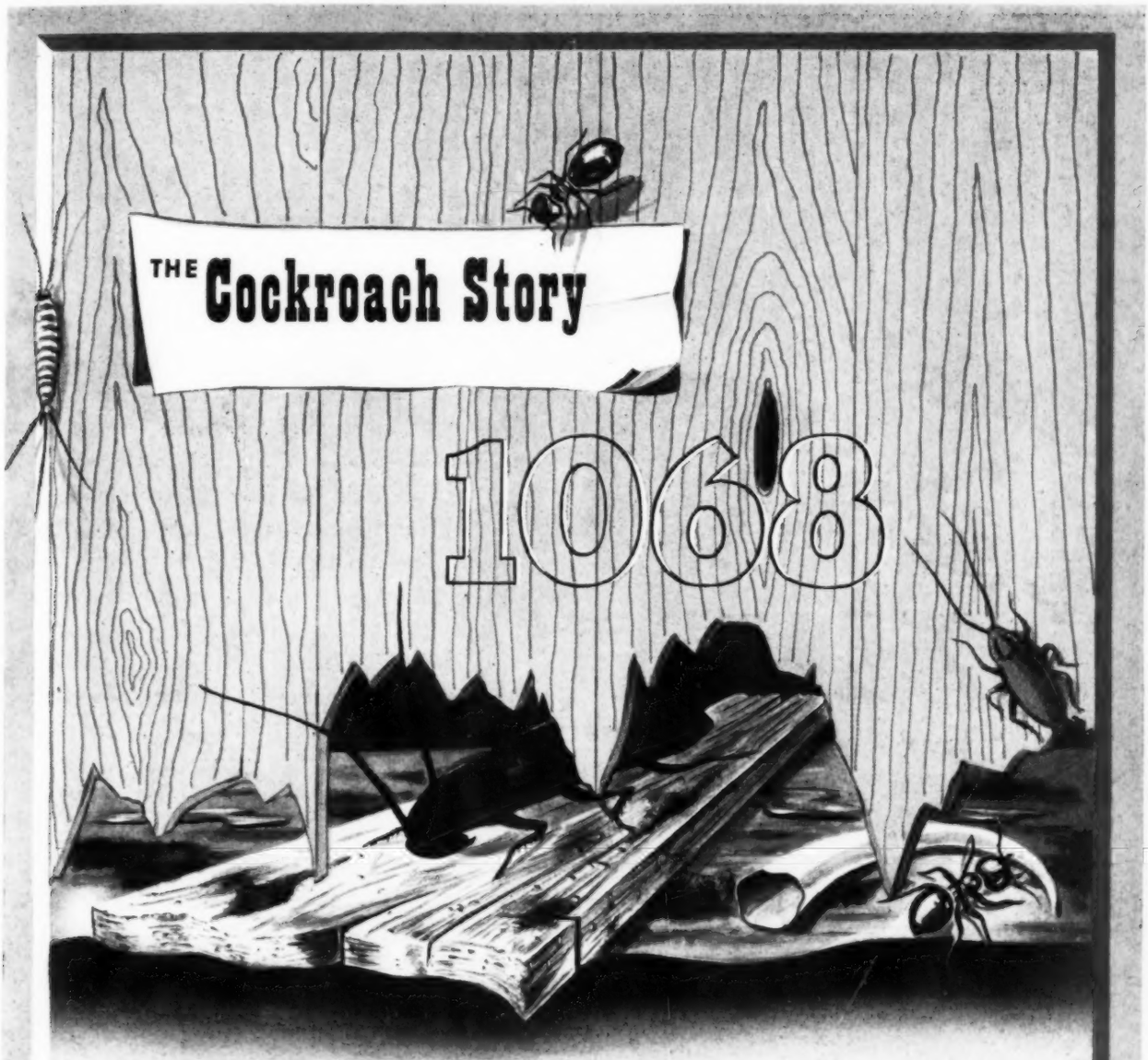

Oldest and most persistent of the insects, the cockroach began life early in the Paleozoic Age. The dinosaur, the pterodactyl, and the mastodon have fallen by the wayside, but the cockroach has survived. So well has it adapted itself by its hide-and-seek psychology to changing environments that today this nocturnal prowler, filthy and fetid, has become a major sanitation problem to large sections of our industrial and institutional life, as well as to our householders.

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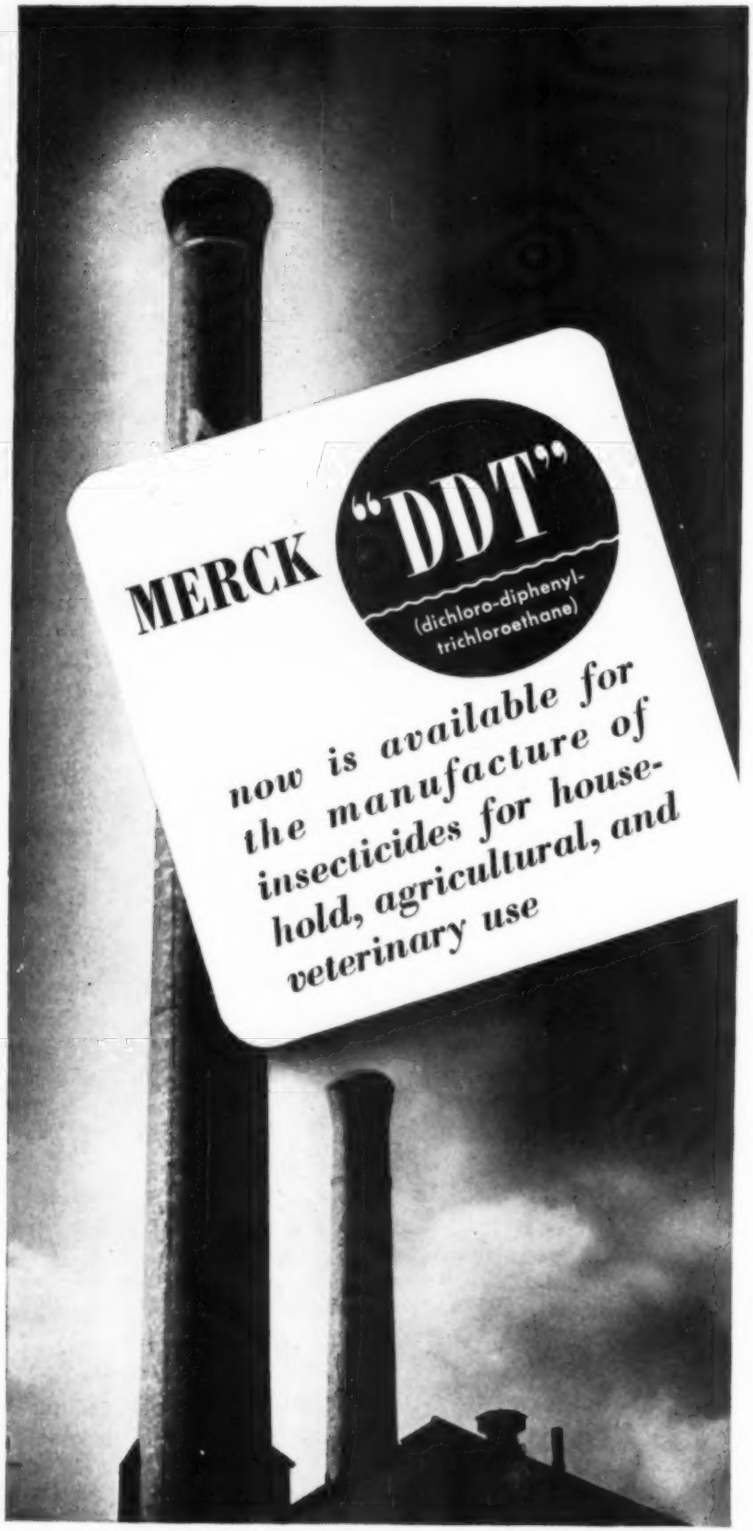
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THE EDITOR COMMENTS

LEGISLATION and proposed legislation aimed to restrict the use of insecticides, especially because of their effects on bees, pose a serious problem for the industry as well as for the large insecticide consumer. Having observed the arguments on both sides, it is quite obvious that the problem is going to be a tough one to solve. If the grower did not control the depredations of the insects, consequent curtailment in food production could threaten the entire economic set-up of the nation. But if bees and other pollenating insects are killed off over wide areas, not only are the bee-keepers faced with extermination, but the same threat to food production is also established.

Level heads are working to solve this problem sensibly and to avoid snap-judgment legislation. Ill-advised local laws adopted in the heat of anger are not the answer. Give state officials, growers, bee-keepers, and the insecticide industry time, and a satisfactory pattern of control will be found. Large insecticide users are fully conscious of their responsibility and we feel certain are ready to play their part. In the meantime, local or other restrictive laws should await an early calm consideration of the subject.

THE fertilizer industry in particular and private enterprise in general have reason to enjoy at least temporary encouragement as the result of recent action of the U. S. Senate. A proposed amendment to H.R. 6777 calling for a $3,000,000 appropriation for construction of a government fertilizer plant at Mobile, Alabama, under the jurisdiction of the Tennessee Valley Authority failed of adoption in Senate committee deliberations.

Increasing government competition, and potential competition, in the fertilizer business has, as is quite well known, been a constant thorn in the side of the industry. The rejection of further proposed competition from government at this time is significant. It may mark the beginning of a turn away from obvious pressure trends toward socialization in industry as more thoughtful legislative minds weigh the consequences of a government-dominated fertilizer industry. God help American agriculture if the day might ever come when fertilizers were anything akin to a government monopoly and subject to the machinations of congressional politicians and no longer products of the open competition of free enterprise!

DURING the war years, American agriculture has on the whole obtained its supplies of necessary chemicals at relatively low prices. Compared to the prices at which agricultural products have sold since 1941, growers have been in fact buying their fertilizers, insecticides, fungicides and other chemical necessities dirt cheap. Looking at the price picture today for basic chemical materials, it would appear that the end of this lower price period for agricultural chemicals may be quite near at hand.

The uptrend in basic chemicals becomes more pronounced, encouraged by a supply situation which appears to go from bad to worse. In fact, it is more difficult to purchase many basic chemicals today, irrespective of price, than it was during the most active period of the war. Manufacturers are stumped and their hands are tied. They simply cannot for one reason or another produce the chemicals to meet the unrelenting demand. This cannot help but be reflected in prices, especially resale prices, and also in the cost of finished agricultural chemical products.

However, as far as we can determine, higher prices appear to be acceptable to the average grower and other consumer provided the increases are not excessive. They understand full well the manner in which the costs of their suppliers are mounting. In fact, observations would seem to indicate that if they are worried about the situation, their worries are more in the direction of adequate supplies rather than price.

Guest Editorial written especially for this issue of Agricultural Chemicals.

The Development of Agricultural Chemicals

By Allen B. Lemmon

Chief — Bureau of Chemistry, California Department of Agriculture

NOT many years ago a complete list of agricultural chemicals would have shown only a few arsenical compounds for chewing insects, a few contact insecticides for sucking insects, and copper compounds and sulphur for fungi. The agricultural chemical field is expanding tremendously, not only in volume, but in complexity, and today the list is so large and specific that even a brief summary is difficult.

The tonnage of commercial fertilizers sold in California, for example, has been doubling each ten years, as has the number of economic poison products registered for sale in this one State. There were 1,700 such products on the market in 1926, 3,500 in 1936, and at the present time there are over 7,000.

Intensified research is bringing an avalanche of new products and new uses for old products. The staggering complexity of modern organic chemistry has led to use of initial nicknames, such as DDT, 2,4-D, TDE, and numbers, such as 666, 1068, and 1080.

Agricultural chemicals have been developed for a multitude of purposes, for example:

To defoliate cotton plants before picking and to defoliate rosebushes in nursery fields before digging.

To impregnate paper fruit wraps to inhibit growth of fungi in packed fruit.

To break the rest period of dormant buds and start their early development.

To accelerate ripening of picked fruit.

To induce polyploidy, doubling of chromosomes in plants, of value to plant breeders in development of new varieties.

To prevent discoloration of lettuce butts in packing or apples cut for drying.

To devitalize pollen or kill blossoms for reducing set of fruit.

To reduce drop of maturing fruit.

To kill potato tops at harvest time.

To promote or to inhibit sprouting of seed potatoes.

To prevent sap-staining of freshly cut lumber.

To prepare mildew-resistant paints.

To induce rooting of cuttings.

To set fruit without pollen, producing parthenocarpic or seedless fruit.

(Turn to Page 34)

GRASSHOPPER CONTROL

Photo of poisoned grasshoppers, courtesy USDA Bureau of Entomology and Plant Quarantine.

By Claude Wakeland

Bureau of Entomology and Plant Quarantine
U. S. Department of Agriculture

GRASSHOPPERS destroyed crops valued at $401,800,000 in twenty-four Western and Midwestern States during the ten-year period, 1936-1945. During that same period, and in the same states, cooperative control by farmers, States, and the Federal Government saved crops worth $601,800,000 from destruction by grasshoppers. In accomplishing a crop saving of more than $600,000,000, the Federal Government spent $12,785,518 and cooperating farmers, counties, and States expended nearly an equal amount, or $11,846,000, in actual cash or its equivalent. Why, it may be asked, did grasshoppers destroy more than $400,000,000 worth of crops during a period of time when control results were notably successful? Therein lies a question, an answer to which is suggested in this discussion.

The Committee on Coordination of the War Effort, appointed by the American Association of Economic Entomologists in 1944, set out to determine the importance of insects as crop destroyers. The subcommittee on wheat insects polled entomologists in the twenty-two states and the Canadian provinces having the largest wheat production in recent years. This poll revealed the fact that grasshoppers were classed as the Number One Enemy of wheat in the Northern or Spring Wheat Area and in the Western or Hard Wheat Area. A similar survey of destructiveness of insects to alfalfa, corn, barley, cotton (in restricted localities), flax, and forage crops would place grasshoppers at or near the top of the list of crop enemies.

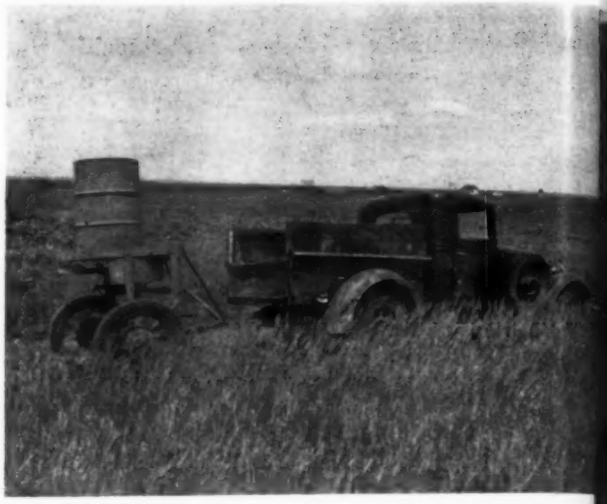
That the grasshopper problem is not new in the United States is shown by factual and historical record and by the devastating losses sustained by millions of farmers since shortly after agriculture was established in this country. In his paper, "Grasshopper Outbreaks During the Past One Hundred Years," Dr. J. R. Parker, in charge of grasshopper research for the Bureau of Entomology and Plant Quarantine, brings out the fact that in the States of the Great Plains and the Rocky Mountain and Plateau regions and contiguous States, grasshoppers are present in injurious numbers somewhere every year and that extensive and widespread outbreaks have occurred three times during these one hundred years of record. During that same period, however, Montana experienced fifty outbreak years of which twenty-five were severe; Minnesota, fifty outbreaks of which eighteen were severe; Colorado, forty-seven outbreaks of which twenty-one were severe. Five other states, namely, North Dakota, Kansas, South Dakota, Utah, and Wyoming, had thirty-five or more outbreaks of which ten or more were severe. The last extensive outbreak reached a peak in 1938 and 1939, and the infestation subsided to a low point in 1943. The population increased slightly in 1945 and indications are that it may increase further in 1946 with a trend toward the building up of another major outbreak.

Although there are several hundred species of grasshoppers, less than a dozen are ordinarily destructive to crops. Because of its geographical distribution, migratory propensity, and versatile feeding and egg laying habits, the lesser migratory grasshopper has been the most destructive species and the one requiring the greatest control effort during the period 1938-1946. During the period 1940 to the present, this species has become of less importance in numbers in the grasshopper area as a whole although it is still present in all states from Canada to Mexico and from the Mississippi River to the Pacific Coast. With a succession of years favorable to its survival and reproduction, it could again become the major destructive species.

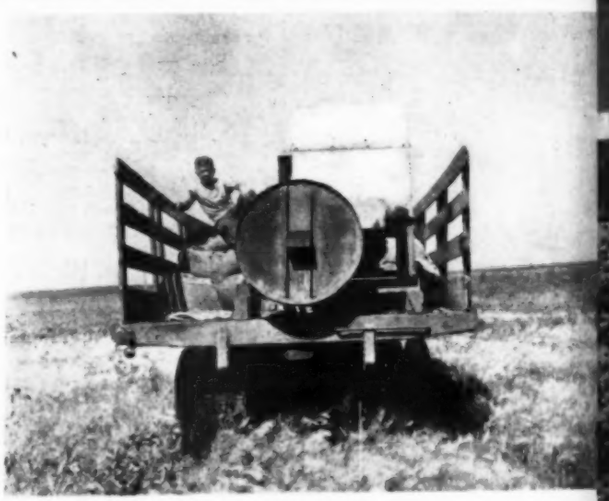
Many Factors Involved

THE factors that cause recession of the importance of one species of grasshopper are likely to favor the increase and spread of other species, so the species distribution map varies markedly from year to year. These factors may be climatic, the replacement of old crops by new, or others that are little understood or that are not recognized. For example, where the predominant species in South Dakota in 1939 was the lesser migratory grasshopper, it is now the differential grasshopper; where the predominant species in Minnesota in 1939 was the lesser migratory grasshopper, it now is the red-legged grasshopper; where the predominant species in Wisconsin used to be the clear-winged grasshopper, it was the lesser migratory grasshopper in 1938 and 1939, and was the two-striped grasshopper in 1942; where grasshoppers were of only minor importance in the Salt River Valley of Arizona when cotton was the chief crop and fields were generally plowed and cultivated, they are now a decidedly controlling factor in the production of alfalfa seed and hay which are being produced on the acreage that formerly was planted to cotton. Numerous instances of the succession of species could be cited in all of the main grasshopper states.

Prior to 1934, grasshopper control, although it was conducted on a large scale in many states and communities, was financed wholly by individuals, communities, or States. In

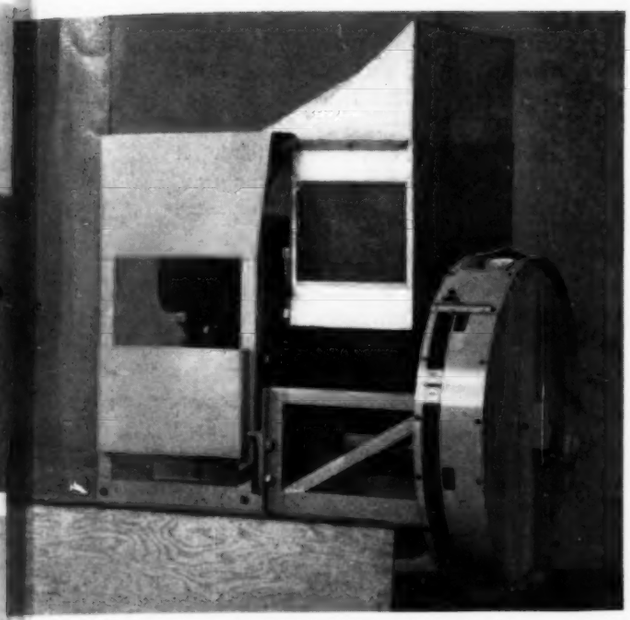


Traction - type grasshopper bait spreader pulled by pickup truck. Spreader mechanism propelled by differential and drive shaft of discarded auto rear axle.

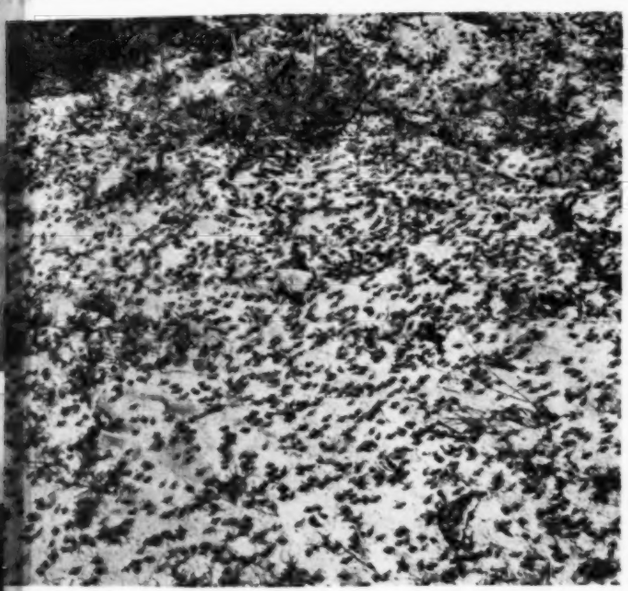


Blower-spreader mounted on truck for distributing bait in field. This method gives good coverage also. Blower-spreader is of U. S. Department of Agriculture design.

After bait is spread, grasshoppers by the millions feed on it. Here are nymphs of Dissosteria Longipennis blacking out a Colorado road on which bait has been spread.



Closeup of U. S. Department of Agriculture blower spreader. These have been used with success for a number of seasons in various parts of the country.



Migrating long-winged grasshoppers of the plains traveling in heat of day. This USDA photo taken in Colorado is representative of infestation which covers large areas during height of season.

Graphic example of destruction caused by uncontrolled grasshopper invasion. This was a prosperous Texas cornfield before arrival of grasshoppers.

a single year, Minnesota spent $250,000 and North Dakota $110,000 on grasshopper control. Were the aggregate expenditures of the principal grasshopper States available, they would reveal widespread participation by States, by counties, and by farmers.

The availability of funds had been so uncertain that even in places where they became available it was difficult or impossible, on such short notice, to organize an effective control program. States and farmers reached the conclusion generally that grasshopper control was a problem so extensive and far-reaching that it was beyond the scope of communities or States. Congress first recognized the regional importance of the grasshopper problem in 1934 by appropriating funds for cooperating with States in their control. Federal assistance has been available each year since that date. The ensuing control programs were so successful that, with the development of the extremely severe outbreak of 1938, Congress passed an enabling act authorizing the appropriation annually of funds for cooperating with the States in grasshopper control. Since that time, cooperative control has been conducted each year under funds provided by Congress in accordance with the needs as determined by an annual survey.

Research and Control

THE grasshopper work of the Bureau logically falls into two classes: research and control. Research is conducted by the Division of Cereal and Forage Insect Investigations. Control work is conducted by the Division of Grasshopper Control. Baits used in control operations are based upon recommendations of the Research Division and cooperation between the two divisions is close and continuous. Only control work will be discussed in this article.

One of the principal functions of the Division of Grasshopper Control of the Bureau of Entomology and Plant Quarantine is to conduct annual surveys to determine the degree and the extent of the infestation to be expected in the subsequent control year. State agencies are requested to participate in this survey to the fullest extent possible, and many of them have assisted by supplying personnel. The areas infested by adult grasshoppers are first determined, by sur-

vey, during the months of July, August, and September, and mapped to serve as a guide for delimiting the areas where an egg survey should be made to determine the abundance and distribution of eggs. The egg survey is made during the months of September and October or, in some southern districts, as late as November. The egg survey data are also plotted on a map. From the two maps the size of the infestations to be expected in the succeeding year is visually apparent, classified in four categories: "light," "threatening," "severe," and "very severe." From a rating table and from knowledge gained by experience of the degree of participation of farmers in grasshopper control in various areas, it is practicable to derive data that are reasonably accurate as a basis for converting the information into an estimate of bait, equipment, and personnel needed which is interpreted further into an estimate of the funds necessary for conducting the contemplated control campaign. The survey is not intended to reveal the infestation or the control problem to be expected in a specific county or on a specific farm, but does provide a fairly reliable knowledge of the areas as a whole.

Indicative of the extent of the survey, it may be cited that, in determining the control campaign to be conducted in 1946, surveys were made in 489 counties of 19 states; 1,975 examinations or stops were made in the adult survey; and 1,565 stops were made in the egg survey.

Grasshopper control primarily is the direct responsibility of the farmer whose crops need protection from grasshopper attack. The bait materials are furnished without cost by the Federal Government, but the cooperating county has the responsibility of storing them, of mixing them into the form of wet bait and of issuing them to the using farmers. These functions are the responsibility of the County Leader.

Grasshopper control is outstandingly successful only when a large majority of the farmers in an infested community or county cooperate wholeheartedly in baiting their infested fields soon after grasshoppers hatch in the spring. Repeat baiting is necessary as often as is necessary to obtain satisfactory control. Unfortunately, even though they can obtain bait materials without cost, too many farmers do not spread bait, or bait too late or too little to obtain results. This is the primary cause for the enormous losses spoken of earlier, although during the same period of time and in the same states, over $600,000,000 worth of crops were saved by baiting for grasshopper control. The unknown and unmeasured loss is that suffered by farmers over widespread areas where grasshopper damage is not sufficiently noticeable to attract attention readily or to stimulate control activity. Generally, grasshopper damage of as much as 5 per cent or 10 per cent is taken as a matter of course, but such loss annually amounts to a substantial sum when the diversity of the crops attacked and the size of the infested areas are considered.

Methods of Control

CONTROL of grasshoppers by plowing, to destroy the eggs, and the use of hopper dozers, to catch the nymphs and adults, was general practice, though largely ineffectual, until near the end of the nineteenth century. The first reported use of an arsenic-bran bait was by Coquillett in California in 1885. For many years the bait generally recommended by the Government and by State agencies was comprised of bran, Paris green or white arsenic, molasses, and citrus fruits, with salt sometimes added. Later, amyl acetate (artificial banana oil) was substituted for the more expensive citrus fruits. The generally recommended bait for grasshopper control during the first two decades of the present century was prepared from bran, Paris green or white arsenic, molasses, and amyl acetate with sufficient water to make a moist, crumbly mash.

Ever since poison bait was first used, wheat bran has been the organic substance most palatable to grasshoppers and available in quantities sufficient to meet the demand for bait. It is the "food" portion of most of the baits that have been developed.

Accumulation of evidence led to the conclusion that amyl acetate and molasses were of little or no value in improving the effectiveness or attractiveness of grasshopper baits and that their inclusion added unnecessarily to the cost of the bait. With the development of large-scale cooperative programs it became necessary to lessen the cost of the bait and to extend the available supply of bran by incorporating materials of lower cost into the bait. It was found that a portion of the bran, which is expensive, could be replaced by less-expensive sawdust or cottonseed hulls without materially reducing effectiveness, and the bait used in the first large-scale program in which the Bureau of Entomology and Plant Quarantine cooperated with the States was composed of millrun bran, sawdust, crude arsenic, and cane molasses.

Liquid sodium arsenite was found to be as effective as crude arsenic in grasshopper baits and was used almost exclusively in the cooperative control campaigns from 1938 to 1943. It had the advantage of mixing readily with water and therefore the bran and sawdust particles could be moistened uniformly with the toxic liquid. Federal and State research workers proved that sodium fluosilicate was at least equal in toxicity to the arsenicals and that it killed grasshoppers in less time. For several years after this became known, sodium fluosilicate was not used because the supply was insufficient and the cost was double that of sodium arsenite. Then war requirements took sodium arsenite completely out of the market, and released quantities of sodium fluosilicate sufficient for use in grasshopper bait, and lowered the price to a level favorably comparable with that of sodium arsenite. During the 1943, 1944, 1945, and 1946 control seasons, sodium fluosilicate was and is being purchased by the Government to be used in grasshopper bait. Sodium arsenite is not now being purchased for this purpose. The formula being used for 100 lbs. of bait, dry weight, is as follows:

Millrun bran, 25 pounds	1 vol.
Sawdust	3 vols.
Sodium fluosilicate	4 lbs.
Water to make a moist, crumbly mash	10-12 gals.

Contrary to popular belief, there is no known bait that is definitely attractive to grasshoppers. Indeed, the term "bait" is a misnomer for it implies that grasshoppers are lured by the poisoned mixture that has been scattered to kill them. Apparently,

(*Turn to Page* 57)

SABADILLA

By Carl H. Krieger, Ph.D.
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Sabadilla comes from seed of Schoenocaulon, grown in U. S., Mexico, Costa Rica, El Salvador, Guatemala, Honduras, Peru and Venzuela in South America.

FOR many centuries considerable time and effort has been spent in the control of insect pests. As cultivation progressed and a definite pattern of agriculture was initiated, the control of insects broadened to include those affecting both warm blooded animals and vegetation. Concomitant with this increase in scope, numerous new avenues of approach to the insecticide problem were opened. Although poisonous inorganic materials, such as arsenic and fluorine compounds, still hold a definite place in the insecticide field, synthetic organic compounds as well as insecticides derived from plant sources have offered many new possibilities. Toxicants derived entirely from plants, such as pyrethrum, rotenone, and nicotine have become of increasing value in the control of insects.

The supply of pyrethrum and rotenone depends largely on importations from the Far East, Africa, and South America. However, due to war conditions, these supplies were markedly reduced and in some instances eliminated entirely. Consequently, serious efforts were made in the United States to replace these imported insecticides. Although nicotine, an insecticide native to the United States, and certain organic synthetics had been substituted to some extent, pyrethrum and rotenone were not adequately replaced, particularly in cases where an insecticide non-poisonous to warm blooded animals was desired. This situation tended further to stimulate insecticidal investigation of other plant sources, particularly those species of plants indigenous to Central and North America.

During the latter part of the last decade research was begun by the University of Wisconsin's Department of Economic Entomology to find some plant materials possessing insecticidal properties. Early in 1939 it was found that the seed of the species of Schoenocaulon, commonly known as sabadilla, was among the more promising substances tested. The possibility that sabadilla might have insecticidal potentialities was considered as far back as the sixteenth century when it was recorded that this material was used to destroy vermin breeding in wounds and sores. Since that time frequent reference has been made to the use of sabadilla in one form or another as a vermifuge or as an insecticide, although no detailed study of its insecticidal properties has been reported.

Sabadilla is a plant belonging to the Family Liliaceae and was first described as Indian Caustick Barley in 1640. There are at least twenty species of this plant, three of which occur in the United States. Nineteen species have been found in Mexico and one species Schoenocaulon officianale is indigenous to Costa Rica, El Salvador, Guatemala, Honduras, Peru, and Venezuela. The name sabadilla is derived from the Spanish cebadilja which refers to barley, probably due to the similarity between this plant and barley, particularly in the formation of the seed.

Sabadilla is not a cultivated crop, and, hence, in areas where it grows it is found in a semi-wild state. The seed is gathered by natives in quantities sufficient to supply the demand. The demand for sabadilla seed in the past has been small, since its

use as a vermifuge has declined considerably over the years. With the recent advent of sabadilla as an insecticide there has been a marked increase of interest in gathering the seed. Although sabadilla can be grown as a cultivated crop in Texas, to date it is not economically feasible, as the yield per acre of land is too small. Hence, for the present, it remains necessary to depend on importations from South America.

Toxicity of Sabadilla

THE toxicity of sabadilla seed is probably associated with a complex mixture of alkaloids having the group name of veratrine, composed of several alkaloids known as cevadine, veratridine, sabadilline, and sabadine. Although these alkaloids have been known for some time, their chemistry is still rather obscure. Also, lacking definite establishment is the direct correlation between the alkaloidal content of the seed and its toxicity. Pharmacologically, veratrine produces effects similar to the cardiac glucosides. The alkaloids are found principally in the endosperm, embryo, and coat of the seed.

In the initial experiments on sabadilla at the University of Wisconsin, the common house fly served to evaluate toxicity of the seed. Over twenty different samples of sabadilla seed were extracted with highly refined kerosene by a standardized extraction procedure. This procedure consisted of mechanically stirring known amounts of the powdered seed and kerosene at a fixed temperature. Experimentation revealed that an extraction period of one hour gave the maximum potency. The extracts were tested on flies and the relative toxicity was recorded, indicating that only those samples which had been in the powdered state for some time possessed toxicity. Freshly ground seed was devoid of toxicity. This inconsistency in biological activity stimulated search for the factor or factors which would produce more uniform results.

In the course of study it was found that the toxicity of sabadilla could be increased by raising the temperature during extraction. Consequently, further experiments with sabadilla seed at temperatures from 25°C to above 150°C revealed a rapid increase in toxicity concomitant with an increase in temperature, with a maximum at 150°C. This held regardless of whether the seed had previously revealed toxicity or not. The application of the hot extraction method to other parts of the plant, such as the roots, bulb, leaves and spikes, revealed no toxicity with the exception of the spikes which contain the immature seed capsules.

Subjecting the seed to heat prior to extraction also increased the toxicity. In this study the powdered seed samples were subjected to various temperatures followed by kerosene extraction at 25°C. Preheating the seeds to 150°C for one hour resulted in a toxicity which agreed favorably with the hot extraction at the same temperature. This toxicity developed regardless of whether or not the seeds were freshly powdered. [1]

In an attempt to find still another means of increasing the toxicity of the sabadilla seeds it was found that treating the powdered seed with alkali was also effective. This treatment, prior to kerosene extraction, made it possible to obtain the maximum toxicity at a lower extraction temperature. In fact, an extraction temperature of 60°C was almost as effective as extractions of untreated seed at 150°C. [2]

Since freshly powdered seeds showed little biological activity as compared with the aged powder, the effect of aging on toxicity was studied. These tests revealed that on aging, the toxic constituent of the powdered seed was made more available to the kerosene. The naturally aged powders showed considerable variation in toxicity. On the other hand, the toxicity of the whole seed was quite stable upon storage. However, even though the whole seed was aged, a cool extract of a freshly powdered sample was not toxic. Kerosene extracts of sabadilla seed stored in tightly closed amber glass bottles showed no loss of activity up to twenty-two months. However, exposure of kerosene extracts to light caused a rapid deterioration of the toxicity during the first two weeks.

Synergistic Combinations

REPORTS in the literature stated that synergism had been known to occur when certain insecticides were used in combination. In fact, in 1935 such a claim was made for sabadilla and derris. A greater insecticidal effect was obtained when these two were used in combination than when either insecticide was used separately. Further investigation showed that sabadilla and pyrethrum did not complement each other. On the other hand, sabadilla and "Lethane" (an aliphatic thiocyanate) in combination were found to have a synergistic relationship. The toxicity of this combination was at least double that of each constituent. Hence, this combination offers an insecticide containing smaller amounts of each constituent with a more effective range of operation.

Since the common house fly had been used throughout these experiments, it was conclusively established that sabadilla was extremely toxic, particularly to the fly. Furthermore, due to the alkaloidal content of the sabadilla seed, as well as the reports in the literature regarding the poisonous characteristics of sabadilla preparations in the treatment of certain mammalian infestations, it was deemed desirable to study the effect of these extracts on a warm blooded animal. As a result a series of experiments were designed to compare the physiological effects of kerosene extracts of sabadilla with those of other common insecticides. The laboratory rat served as the experimental animal.

In one experiment kerosene solutions of sabadilla, rotenone, and "Lethane" were administered orally, and in another these same solutions were applied externally to the skin.

[1] Heat treated sabadilla insecticides are covered by U. S. Letters Patent No. 2,390,911, assigned to Wisconsin Alumni Research Foundation.

[2] Lime treated sabadilla insecticides are covered by a pending U. S. Patent Applicaton, assigned to the Wisconsin Alumni Research Foundation.

[2] Insecticidal combinations of sabadilla and "Lethane" are covered by U. S. Letters Patent No. 2,348,949, assigned to the Wisconsin Alumni Research Foundation.

The solutions were of a strength slightly greater than would be commonly encountered in household fly sprays. These experiments indicated that sabadilla was definitely irritating. Gross examination showed that this irritation was confined to the mucous membranes and to areas of the body which were in intermittent contact with the solution. Sneezing was quite common. However, it was noted that rotenone extracts were definitely more toxic than sabadilla. In fact, a number of the rotenone treated rats died. No deaths occurred with sabadilla or "Lethane," the latter being slightly less irritating than sabadilla in both experiments.

In a third experiment rats were subjected to a settling mist and a direct spray of kerosene solutions of sabadilla, pyrethrum, and "Lethane." It was again demonstrated that sabadilla was definitely irritating. However, in these experiments "Lethane" was far more toxic than sabadilla. Several deaths occurred in the "Lethane" group. Pyrethrum was less irritating than sabadilla.

From these experiments on rats it was concluded that a kerosene extract of sabadilla was toxic and irritating to warm blooded animals, but not to any greater extent than other toxicants commonly considered as safe for domestic use.

Thorough Research

ALTHOUGH it had been established that (a) kerosene extracts of sabadilla were very toxic to the house fly, (b) that this toxicity could be increased and controlled by a heat and/or alkali treatment, and (c) that the insecticide was not more toxic to warm blooded animals than other insecticides, the work on sabadilla did not stop here. In fact, the Wisconsin group felt that it had just scratched the surface and started to cast about for new departures. Immediately several questions arose. Would the heat or alkali treatment of the powdered seed be as effective when the sabadilla was used as a dust rather than as a kerosene spray? If this were true, what effect would sabadilla have on other insects? What is the chemistry of the alkaloids in sabadilla seed, and what alkaloid or alkaloids are the toxic factors? Simultaneous research was thereupon started to find the answers to these questions.

Insecticidal use for Sabadilla on increase as research probes deeper into its broadening potentialities.

Research revealed that the heat or alkali treatment of sabadilla seeds resulted in a dust which had an increased toxic efficiency with a minimum amount of seed. In the heat treatment coarsely ground sabadilla seeds were heated for four hours at 75°C to 80°C. The material was then cooled and finely powdered with some diluent, such as talc or sulfur. In activation by alkali treatment, it was found that the preparation of a concentrate with hydrated lime, or using this material as a diluent in the dust, was the easiest and most effective method of activation. The activated powders were diluted further with talc, sulfur, or some other diluent to yield dusts of various concentrations from 1 per cent to 50 per cent of the sabadilla seed.

The development of the activated dusts was immediately followed by many laboratory and field tests. For over two years dusts of various concentrations under a variety of conditions have been applied to a large number of insects. To date the work is far from complete, but many very interesting and practical observations have been made. Work is still in progress and extensive field trials are being carried out this summer.

In the laboratory and field trials it has been demonstrated that sabadilla definitely has a place of its own in the insecticide field. It controls insects hitherto impossible to keep under control. In many instances sabadilla is superior to rotenone and pyrethrum, because it does not injure foliage which precludes precautionary measures. Furthermore, sabadilla has the distinct advantage of not being very harmful to pollinating or other beneficial forms of insects. It is especially desirable for crops where a poisonous residue must be avoided.

Controls Many Pests

SABADILLA dusts, containing from 10 per cent to 20 per cent sabadilla seed, are very toxic to sucking plant bugs, such as squash bugs, lygus bugs, chinch bugs, and harlequin bugs. Extensive field trials in Wisconsin, Arizona, New Mexico, Utah, California, and Oregon, in addition to many southern and southeastern states, have revealed that sabadilla is impressively successful in combatting such insects. Furthermore, excellent results have been achieved in the control of leaf hoppers on potatoes, beans, and peanuts. Sabadilla also gives fair control of mixed populations of cabbage caterpillars on members of the cabbage family. In addition, favorable results have been reported indicating that sabadilla is effective in combatting the grape leafhopper, the gypsy moth, the large milkweed bug, the red-legged grasshopper, cattle lice, as well as the blunt-nosed leafhopper and the black-headed fireworm which infest cranberries.

Field tests showed that the correct timing of the second and third application of sabadilla dusts was important. Although sabadilla has a residual power greater than pyreth-

(Turn to Page 32)

Use of COPPER as a FUNGICIDE

By Dr. L. Gordon Utter

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Protection of agricultural crops is still dependent on major copper fungicides to a large degree. New synthetic fungicides show promise, but copper continues to dominate.

THE fungicidal value of copper, when used as copper sulfate, was first reported by Prevost in France about 1807 in the treatment of grain seed against infection from smut diseases. Today, copper sulfate and other copper compounds have acquired the status of highly important and dependable fungicides for the prevention and control of a large number of major plant diseases. Their performance in this respect is clearly recognized by the wide usage they have had in combating disease attacks on leading agricultural crops. This role is even more significant today with high quality and maximum crop yields being demanded from our farmers. Copper fungicides are also important in protecting ornamental and flowering plants from injury or destruction by fungus diseases.

The United States Department of Agriculture estimated that for 1944, 112,207,500 pounds of copper fungicides, calculated as copper sulfate, would be required for various agricultural purposes. Based on O. P. A. ceiling prices for 1944, the value of these copper fungicides would amount to well over $7,000,000. Dr. S. E. A. McCallan, in his interesting paper on "Outstanding Diseases of Agricultural Crops and Uses of Fungicides in the United States" (Contributions Boyce Thompson Institute, Vol. 14, No. 3, 1946), estimates the yearly comsumption of copper in fungicides at 23,500,000 pounds. Calculated on a copper sulfate basis, this would amount to 94,000,000 pounds which compares with the previous figures, and is probably more representative of the normal average yearly requirements.

The separation of the various commercial copper fungicide products into groups of compounds, descriptive of their chemical nature, provides a further interesting means of analyzing consumption. It has been estimated that approximately 80 per cent of the total copper fungicides used annually consist of copper sulfate, both pentahydrate and monohydrate. Copper carbonate and copper oxide together account for roughly 10 per cent, while the basic copper sulfates and basic copper chlorides make up the remaining 10 per cent. The exceedingly high percentage of copper sulfate being consumed is indicative of the continued wide usage of Bordeaux mixture, since copper sulfate is one of the basic ingredients.

Bordeaux Best Known

HISTORICALLY, Bordeaux mixture is the oldest and best known of the copper fungicides, although in 1873 solutions of copper sulfate were popularly employed to disinfect wheat seed against the bunt disease. Bordeaux mixture had its origin in France, where in 1878 and several succeeding years the destructiveness

Spraying Bordeaux Mixture On Potato Fields

For over a half century, copper fungicide known as Bordeaux mixture has helped control plant diseases. Although the fungicide has not changed a great deal within that time, methods of application have. At the right are seen two modern fungicidal-spraying outfits working in potato fields. Such equipment provides fast, economical and thorough coverage of given area. (Photo on left courtesy Maine Agricultural Extension Service, other photo courtesy AIF Association.)

of the downy mildew disease to the vines seriously threatened the grape industry. Millardet in 1882 observed that grape vines growing along the highway near Bordeaux, and other sections, appeared to be comparatively free from injury. Further investigation showed that these vines had been sprinkled with a mixture of milk of lime and bluestone (copper sulfate). The purpose of this treatment was to give the vines a poisonous aspect so that frequenters of the highway would be deterred from stealing the grapes. Suspecting the signficance of this mixture, Millardet, in collaboration with Gayon, Professor of Chemistry at Bordeaux, carried out some experiments, and in 1885 described the preparation of Bordeaux mixture. His original formula consisted of 17.6 pounds of bluestone and 33 pounds of quicklime to 34 gallons of water which is considerably stronger than any formula employed today. It is apparent that applications of Bordeaux were made to control downy mildew a year or two prior to the publication of Millardet's formula, since Lawson-Scribner of the United States Department of Agriculture was aware of this work, and in 1885 wrote an article on the use of this copper fungicide. From that time on, Bordeaux mixture became increasingly important as a spray material in the United States.

Today, the standard formula for Bordeaux mixture is 4-4-50, consisting of 4 pounds of copper sulfate (pentahydrate—$CuSO_4.5H_20$), 4 pounds of fresh hydrated lime, and 50 gallons of water. Various modifications, however, have been made in this formula to meet specific conditions for disease control and application to crops that are copper sensitive. We may now find formulas as low as 1-2-50 and as high as 6-6-50. The lime content, also, has been varied to be more or less than the copper sulfate content. In earlier days a slacked lime was used but it has now given way to the more readily handled hydrated lime. Further difficulties were also formerly imposed upon the grower in preparing Bordeaux, since the only forms of copper sulfate (bluestone or blue vitriol) were the large and small crystals. More recently, the grower has the choice of these same sizes or the granulated, superfine or snow, and instant or powdered grades. All these grades of copper sulfate have a minimum metallic copper content of 25 per cent which places them on an equal basis as far as the amount needed for the Bordeaux formula.

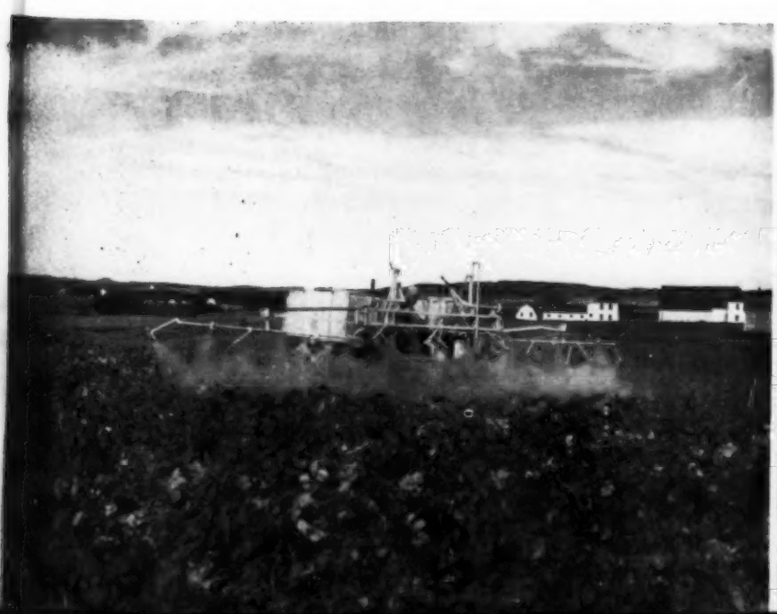
When using the crystal or granulated forms of copper sulfate, it is expedient to make up stock solutions in advance. This inconvenience has, however, now been eliminated by the commercial production of the superfine and instant grades. These materials can be readily dissolved by washing into the spray tank, by various methods. This results in a rapid preparation of a fine quality Bordeaux, and the time and labor thus saved is of definite economic consideration to the grower.

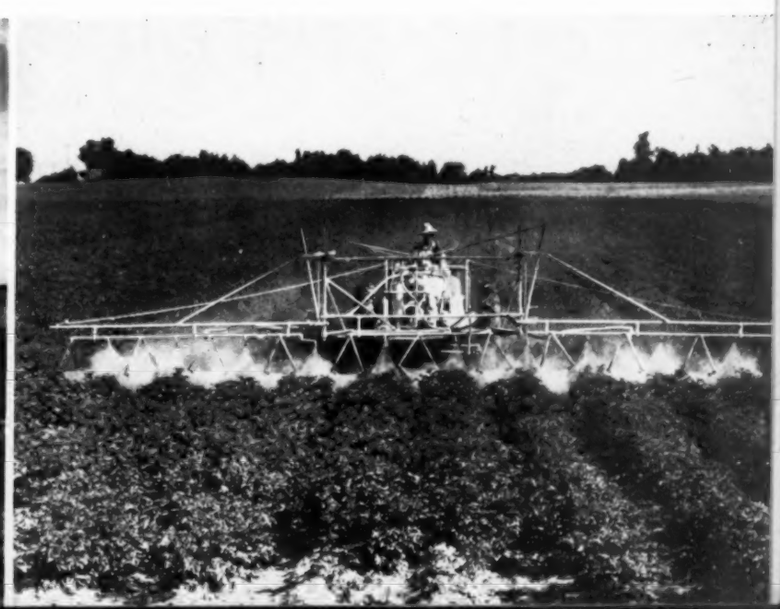
Bordeaux mixture when properly prepared appears as a blue, colloidal precipitate, capable of remaining in suspension for several hours. When sprayed on foliage and permitted to dry it exhibits remarkable coverage and adherence. Such properties contribute measurably toward the efficiency of Bordeaux and are especially desirable in any good fungicide.

Chemically, Bordeaux mixture is a complex basic copper sulfate or hydroxide in which the copper itself becomes slowly soluble. Since the copper, in Bordeaux and other copper fungicides, is now considered to be the active agent in killing the fungus organisms responsible for plant diseases, its slow liberation insures fungicidal protection over an extended period of time.

Wide Acceptance of Copper

FRESHLY prepared Bordeaux mixture today is generally conceded to be the most efficient, economical, and widely used of all cop-





per fungicides. It is recommended for the control of many serious diseases on a variety of crop plants, among which are early and late blights on potatoes; blotch, bitter rot and fire blight on apples; brown rot and leaf curl on peaches; black rot, powdery mildew and leaf spot on grapes; scab and melanose on citrus fruits; leaf spot and blight on tomatoes; early and late blights on celery; leaf blotch and leaf spot on pecans; and leaf spot on sugar beets. In addition to its fungicidal value, Bordeaux has been used rather extensively as a repellent against flea beetles, leafhoppers, and psyllid on potatoes. For the control of other insect pests it can be combined with the arsenicals, nicotine sulfate, DDT, and usually rotenone and pyrethrum.

Around 1910, a serious interest developed in this country in the use of fine dusts as substitutes for sprays. Eight years later, Sanders and Kelsall reported that they had obtained successful control of late blight on potatoes in Nova Scotia with a dust mixture containing 12 pounds of dehydrated copper sulfate, 10 pounds of arsenate of lime, and 78 pounds of hydrated lime. Somewhere in this period, the commercial production of monohydrate copper sulfate ($CuSO_4 \cdot H_2O$), containing 35 per cent metallic copper, was undertaken to provide a copper material designed for dusting purposes. Present day copper-lime dust formulas may range from one having 20 pounds of monohydrate copper sulfate and 80 pounds of hydrated lime to a 30-70 combination. Such mixtures are the dust counterparts of Bordeaux.

For satisfactory results, the copper-lime dusts should only be applied when the foliage is moist with dew or rain. Under such conditions, the copper sulfate and lime react to form a Bordeaux-like deposit on the surface of the foliage. While copper-lime dusts generally can be employed where Bordeaux is recommended, their major use is for controlling diseases on potatoes and some truck crops.

Bordeaux mixture and, to a certain extent, copper-lime dusts, have been credited by various investigators as being injurious to such crop plants as tomatoes and the cucurbits. In most instances, the lime content of these fungicides has been demonstrated as the deleterious factor. The nature of this injury is illustrated as hardening, thickening, and burning of leaf tissues; injury to flowers and growing points through tissue desiccation; stunting, particularly in dry weather; abnormal growth; and reduction in yields. Reports of this kind no doubt were responsible, in part, for stimulating research toward the development of new copper fungicides which would embody the favorable characteristics of Bordeaux, and yet be complete without adding lime, thus reducing the injury factor.

Knowledge Increases

STARTING in the late 20's, there have subsequently appeared a series of copper fungicides to which the terms "low solubles," "insolubles," "neutrals," "fixed coppers" and "basics" have been applied. These compounds are characterized by having the copper molecule fixed more securely chemically so that the copper is only slightly soluble. While the "low solubles" are generally less injurious to foliage and fruits, they are not considered to be as efficient fungicides as Bordeaux, nor to exhibit the same high degree of adherence. They are usually recommended for the control of the same plant diseases as Bordeaux, where they have the particular advantage of being applied either as sprays or dusts. Like Bordeaux, they are compatible with the major insecticides. As dusts the "low solubles" are mixed with suitable diluents such as talcs, gypsum, whiting, clays, etc. Since the copper content of the various "low solubles" may be different, it is customary to calculate the amount to be used, either in sprays or dusts, on the basis of the equivalent metallic copper content of the Bordeaux or copper-lime dust which they are replacing in the disease control program.

On the basis of classification, the various "low soluble" compounds broadly fall into three main groups, the Basic Copper Sulfates, the Basic Copper Chlorides, and the Copper Oxides.

The Basic Copper Sulfates comprise a series of chemically complex compounds ranging from 26 per cent to 53 per cent metallic copper. They are blue to blue-green in color, and occur as powders. Commercially, they are marketed under such trade names as "Basi-cop," "Tribasic," "Spray-cop," etc.

The Basic Copper Chlorides, or Basic Copper Chloride Sulfates, while chemically different from the foregoing group are equally complex in nature. They, too, occur in powder form having blue to blue-green color, with the metallic copper contents running from 24 per cent to 57 per cent. This group is represented commercially by such products as "Copper-A Compound," "Cupro-K," and "C-O-C-S."

Copper Oxides, or specifically Electrolytic Cuprous Oxides originally were produced as a red powder. The development of finer particle sizes has resulted in the yellow form now familiar in the trade. In metallic copper content, the oxides range from 18 to 80 per cent. While valuable in the preparation of fungicidal sprays and dusts, the oxides have also been used successfully for seed treatment.

Basic Copper Carbonates

IN 1917, Darnell-Smith in Australia, demonstrated that another group of copper compounds, the Basic Copper Carbonates ($CuCO_3 \cdot Cu(OH)_2$), were beneficial for controlling bunt of wheat and sorghum smut when applied as a powder to seeds of these crops. Their use for this purpose has been continued since 1920-1921 in the United States. The Copper Carbonates are obtainable commercially as fine green powders, having 20 to 55 per cent metallic copper content.

Other copper compounds have been developed periodically and their fungicidal performance has been evaluated. Such compounds include Bur-

(*Turn to Page* 62)

Report on Results of

Vegetable Seed Treatments

By Paul R. Miller
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DURING 1944 a total of 236 uniform seed treatment tests were conducted by 40 cooperators located in 29 States and two Canadian provinces on 10 vegetable crops as part of a cooperative project started in 1940 under the auspices of a committee appointed by the American Phytopathological Society.

The crops tested were edible soybeans, beets, carrots, cucumber, lettuce, onions, peas, spinach, sweet corn and tomato.

In each case seeds from a single lot were treated by a crop leader at specified dosages and in a uniform manner with three or more seed protectants and distributed to cooperators who conducted germination tests in soil using 5 replications of 100 seeds each.

The 1944 results for the several crops are briefly summarized.

Edible Soybeans: Seventeen tests were conducted by 16 cooperators in 14 States on Banzei soybeans treated with "Arasan," "Spergon," and "Fermate," each at rates of 1½ and 2 oz. per bushel. The results showed that seed protectants were of some value in about one-third of the tests conducted. "Spergon" (2 oz.) gave the most consistent increases in emergence. All of the plots in which significant differences occurred were located in States along the Atlantic Seaboard. The tests showed that if conditions are unfavorable for germination one could expect seed protectants to be of value even with seeds of high vitality, and if seeds of low vitality were used the benefits should

Beets: The results are given for 31 tests conducted in 20 States and one Canadian Province on Detroit Dark Red Beet seeds treated with "Arasan" (.25 per cent, .50 per cent and 1.00 per cent), "Ceresan" (1.0 per cent), and "Yellow Cuprocide" (1.5 per cent). In most of the tests seed treated with "Arasan," "Ceresan," or "Yellow Cuprocide" gave significant increases in number of seedlings compared with untreated seed. "Arasan" at dosages of 0.5 per cent and 1.0 per cent gave the best results but it was not clear whether the differences between these two dosages justify the use of the 1.0 per cent. The striking benefits from seed treatment in the 1944 beet tests in contrast to the limited benefits obtained in a similar test conducted in 1943 are attributed chiefly to differences in vitality and susceptibility to seed decay in two seed lots used. These tests again demonstrate the principle that weak seed lots or weak varieties may show greater response to seed protectants than very vigorous seed lots or varieties.

Carrots: Nineteen tests were conducted in 15 States and 1 Canadian Province on the variety Chantenay treated with "Arasan" and "Spergon" at .5 per cent and .75 per cent, "Semesan" at .42 per cent and red copper oxide and zinc oxide at 1 per cent by weight of seed. All treatments gave increased stands but "Arasan" gave slightly better results than the other materials.

Cucumbers: Cucumbers treated with "Arasan" (.3 per cent), "Yellow Cuprocide" (1.0 per cent), and "Spergon" (0.3 per cent) were tested at 15 locations in 12 States. Beneficial effects from seed protectants were obtained in only about one-fourth of the tests conducted in 1944, whereas similar tests in 1943 gave beneficial effects in practically all cases, indicating that field conditions in 1944 were in general less favorable for seed decay and damping off. Difference in total scores of the treatments used in 1944 indicated that "Semesan" and "Spergon" were the most effective materials. "Arasan," which in 1943 seemed definitely superior to other treatments, did not give particularly good results in the 1944 tests, while "Spergon" proved much more effective than in 1943.

Lettuce: Ten tests on lettuce conducted in 8 States using seeds treated with red copper oxide (2 per cent), "Semesan" (2 per cent), "Arasan" (2 per cent), and "Spergon" (2 per cent), seemed to show that seed treatment is a worthwhile procedure for lettuce. "Spergon" (2 per cent) showed the most marked benefits in these tests although all treatments used proved superior to the untreated seed.

Onions: Reports were made on damping-off control from 11 tests conducted in 8 States and on smut control from 2 tests in 2 States. Approximately one-third of the damping-off tests showed beneficial effect from "Arasan" (.5 per cent and 1 per cent), "Fermate" (.5 per cent and 1 per cent), and "Semesan" (.3 per cent and .5 per cent). No consistent improvement over the untreated seed resulted from "Spergon" (.5 per cent and 1 per cent), red copper oxide (.5 per cent and 1 per cent), or

(Turn to Page 56)

Tree Wound

By Milton A. Lesser

TREES, whether for fruit, timber, water conservation, shade, or merely for beauty, are an important part of our national wealth. Trees which through neglect die or are disfigured, represent the loss of valuable property, some of which can never be replaced. Wounds of various kinds, to which the woody parts of trees are constantly exposed, are primary causes of many tree troubles. Although many small wounds of vigorously growing trees heal without causing any major impairment, an open wound remains a potential portal of entry for pathological organisms or a possible cause of adverse changes in the growth and structure of a tree.

Tree wounds may result from numerous causes. Violent weather conditions like storms, high winds, lightning, and the extra burden of snow and sleet are leading causes of broken tree limbs and stripped bark. Hail, freezing, sunscalding and the like also contribute to these natural causes. Careless use of mechanical equipment and the venturesome proverbial small boy with his knife or hatchet may also be responsible for much damage to bark and trunk. Rodents and other gnawing animals have ruined many valuable trees before the injuries could be discovered and treated. Boring insects, as well as the improper treatment of bore-holes for setting braces and bolts, often open the way for invading fungi and bacteria.

Pruning—itself aiming to improve growth and avoid injury from the elements—may do more harm than good if the use of the knife and saw is not followed up by prompt treatment and the application of an appropriate dressing on the raw, exposed surfaces. Similar prompt follow-up is essential after the excision of decay, cankers and other infected parts. As stressed by Marshall, (1) the promptness and thoroughness with which treatment is given injured trees have much to do with the results obtained. If such wounds are left untreated, or are carelessly treated, disease and decay may become so extensive as to make repair difficult or even impossible. Most large cavities and decayed limbs, he notes, could have been prevented by relatively simple shaping and dressing treatments at the time the wounds occurred.

One of the most important aspects of treating tree injuries is the fact that until it is completely calloused over, a wound remains unprotected from checking and weather influences and is susceptible to attack by the organisms responsible for wood rots. Plant pathologists have tested a wide variety of materials as wound dressings in order to determine their ability to favor callous growth and protect wood that might otherwise be exposed to the effects of weather and pests during the time required for new growths to close completely over the wound.

The requirements of tree wound dressings have been indicated in Cooley's (2) description of an ideal preparation. According to this authority, the ideal dressing should be non-injurious to the callous-initiating cambium and should protect the exposed wood against decay-producing organisms during the several months required for healing. It must have long-lasting effectiveness under seasonal changes. It should not melt and run in summer or become hard, crack and flake in winter. It should adhere to fresh wounds and be easily applied and should be sufficiently porous to let excess moisture evaporate from the wound beneath it. For use in connection with certain diseases, the ideal wound dressing should be toxic to the causal organism but should not injure the tree.

THE requirements, however, are complicated by a number of factors which will materially influence the effectiveness of any dressing. Among these may be mentioned such factors as: climatic conditions, the size of the wound, the species of tree being treated, its relative vigor, the particular kind of insects or fungi that are to be excluded, and many other considerations. All of these points help to explain why no single wound dressing now available seems to serve every need. Hence the orchardist, forester and other plantsmen often find it necessary to employ several preparations to meet varying conditions.

The effectiveness of a tree wound dressing may be greatly enhanced by proper preparation and pretreatment of the injury. Aside from seasonal effects, which must sometimes be taken into consideration, promptness of treatment is probably

Dressings

Dressing material must be resistant to all weather conditions, extreme temperatures, and contribute to wound healing

the most important element in caring for tree wounds. Also of major importance is the shape of the wound. All splintered or diseased wood or bark should be removed by clean cuts that conform to the natural lines of sap flow. More uniform callous development will occur when large wounds are pointed or streamlined in the direction of the main axis of the trunk or branch. All exposed surfaces should be coated with the wound dressing. Regardless of the type of dressing used, it is generally considered advisable that every wound, two inches or more in diameter, be examined within six to twelve months after application of the dressing in order to detect any defects and make necessary repairs.

As a precaution against cross-infection, all tools used for cutting out decay or trimming wounds should be sterilized. For tool sterilization, Marshall (1) employs a mixture consisting of 1 part by volume of a 37 per cent formaldehyde solution to 9 parts of denatured alcohol. Unless the wound dressing is itself antiseptic, all cuts should be sterilized. A 1:1,000 solution of mercuric chloride or a solution of copper sulfate (4 ounces per gallon of water) are suitable for use as antiseptic washes. Of interest in this connection is Tilford's (3) observation that washing tree wounds with aqueous and alcoholic solutions of bichloride of mercury and colloidal sulfur did not prove injurious. All such antiseptic washes should be allowed to dry before applying a wound dressing.

Many substances, used alone or in various combinations, have been recommended and employed as tree wound dressings. Cooley, (2) for example, mentions that more than 500 combinations of various ingredients were made in the search for an ideal dressing, and that many of them were tested by application to pruning wounds and wounds resulting from excision of cankers. Although a few preparations have been patented the great majority of tree wound dressings consist of readily available materials.

Shellac, for instance, is one of the most generally useful substances for treating tree wounds. It is described (1) as "excellent" for affording protection against drying and the effects of antiseptics when applied to the margins of freshly trimmed wounds or cavities. When used as a wound dressing, it does not impair healing and it has been reported (4) that wounds on certain forest trees healed better if given a coat of shellac than if left untreated. Although shellac does not provide the type of dressing usually considered desirable to prevent drying and other adverse weathering effects, comparative tests (2) have shown that better callous developed with this material than with any other dressing investigated. Shellac is frequently recommended (5,6) as a protective coating on wounds prior to the application of tree paint.

With higher weathering resistance, spar varnish is sometimes used as a tree wound dressing. It does not interfere seriously with callous formation, especially if applied over a coat of shellac. Tilford's (3) studies indicate that a varnish of this kind was neither injurious nor beneficial with respect to healing.

Asphaltum, also known as asphalt, bitumen, or mineral pitch, is used quite extensively as a tree wound dressing. It may be used as a solution in various solvents, or in the form of an aqueous emulsion. The former is used chiefly for general purposes, while the latter type finds valuable application on wet, bleeding surfaces. Providing good weathering resistance, Tilford's studies have shown that asphaltum dissolved in a light volatile hydrocarbon solvent consistently stimulated callous formation during the first year following wounding and treatment. This type of dressing was found superior to others in preventing checking and cracking of the wood. Water-asphalt emulsion also stimulated callous production, but not as much as did liquid asphaltum; the emulsion weathered from the wounds more rapidly and did not give protection for as long a time. However, it has been noted (1) that excessively thick asphalt coatings often cause blistering and in some

cases may stimulate decay rather than retard it.

ANOTHER widely used wound dressing consists of combinations of asphalt and creosote. These are often prepared by mixing about three parts of asphalt with about one part of creosote. However, it has been reported (3) that asphaltum dissolved in creosote was distinctly injurious to such trees as elm, maple and hickory. In this connection it should be noted that, when used alone or with creosote, asphalt often fails to prevent infection when applied to wounds not sterilized prior to dressing. While working with a fungus responsible for a killing disease of plane-trees and sycamores, Walter and Mook (7) found that asphalt dressings which killed the causal fungus also killed the cambium and that certain asphalt dressings were not antiseptic and might transmit the causal fungus.

Of related interest is Le Sueur's (8) report that satisfactory results were obtained in the treatment of large stem wounds of trees by the application of a heavy dressing of a refined type of creosote. This was followed by a heavy brush dressing of a proprietary type of colloidal bitumen.

Creosote and coal tar combinations have long been used as tree wound dressings. The raw materials are not uniform and the proportions used are rather variable. One frequently employed combination consists of approximately one part of creosote and three parts of tar. Such preparations are inexpensive and adhere well to freshly made cuts. Against these good qualities, however, must be measured such disadvantages as a tendency to blistering, the fact that they sometimes injure living parts and that in some cases they are of doubtful antiseptic value. Some of these disadvantages may be lessened by the use of more refined raw materials. Avoiding contact with the living margin of the wound or the use of a protective shellac coating on these margins is a helpful safeguard when applying creosote-tar combinations as wound dressings.(1)

Some twenty years ago, Zeller (9) of the Oregon Agricultural Experimental Station developed the efficient wound dressing known as bordeaux paint. This dressing, which must be freshly mixed before use, is made by stirring together raw linseed oil and commercial bordeaux powder to form a thick paint. The dressing may also be made by mixing equal parts by weight of commercial dry bordeaux mixture and linseed oil.(6) Although it will not adhere to wet wood, one of the chief advantages of this dressing is that it is sufficiently porous or pervious to allow evaporation of exuded sap. Hence it does not blister or interfere with the natural deposition of wood gums. While it does not penetrate bark or wood and destroy already-established fungal growths, bordeaux paint is outstanding for its ability to guard wounds from infection and decay. However, this dressing has a tendency to retard the development of the callous during the first season, but York (10) is of the opinion that its high fungicidal power warrants its use, especially on larger wounds.

White lead and linseed oil, mixed together to form a thick paint, is often used as a wound dressing to prevent infection by fungi or bacteria. (11) Tilford's (3) work indicated that lead paint was neither beneficial nor injurious with respect to healing. In Cooley's (2) report it is stated that the white lead-linseed oil preparation probably afforded greater protection from drying than shellac.

VARIOUS waxes or wax-like compositions have long been used as dressings for tree wounds. Marshall (1) mentions that melted beeswax is valuable as a dressing for treating small wounds and for the immediate care of superficial bark wounds. It is also listed among the materials useful for ringing large wounds which are to be treated with a sterilizing agent or a wound dressing that would otherwise be injurious to the cambium.

The many forms of grafting wax are also suitable for the same applications. Long used in the propagation of plants and in the treatment of tree wounds, the technical literature offers a number of formulas for making various grafting waxes. Many of the older preparations contained animal fats like tallow or lard in addition to other ingredients. Modern grafting waxes dispense with such components, as is evident in the following formula given in Bennett's (12) text:

	Parts
Linseed oil	**1.0**
Turpentine oil	**4.0**
Beeswax	**3.0**
Rosin	**9.0**
Methanol	**1.0**

Another grafting wax that is melted and applied with a brush, given in the same source, is said to exclude air and fungi, prevent drying out and to be non-injurious to live tissues. This is made from:

	Parts
Castor oil	**0.25**
Rosin	**5.00**
Beeswax	**1.00**
Charcoal	**0.75**
Glyceryl monostearate	**1.00**

Another grafting wax with lanolin as an important component consists of:

	Parts
Rosin	**50.0**
Wool fat (lanolin)	**20.0**
Ceresin	**15.0**
Beeswax	**5.0**
Rosin oil	**10.00**

Lanolin has found increasing use in tree wound dressings during recent years, largely as a result of the work reported by Shear (13) about a decade ago. In his experiments in which tree wounds were dressed with white lead paint, lanolin, or indoleacetic acid in lanolin (1:200), the most rapid callous formation was obtained with plain lanolin.

Other materials have been used as dressings or aids in the treatment of tree wounds. Rubber latex, for example, is said (1) to have applications similar to those indicated for beeswax and grafting wax. Waterglass (sodium silicate solution) has been used as a tree wound dressing. Studies (3) of its efficiacy indicate that it is neither injurious nor beneficial with respect to healing and that it affords practically no protection. Paraffin has been tried as a wound covering. While wounds so treated made rapid callous growth, the cal-

(*Turn to Page* 60)

How Foreign Countries Carried on

Early DDT Investigations

Part II

By R. G. Roark
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A review of research work on DDT throughout the world and a compilation of test results.

Editor's Note: Part II of Dr. Roark's report on world-wide studies of DDT completes the article. Last month he dealt with the history of early DDT research in Germany, Switzerland and England. This concluding section reports on research findings in Canada, South America, Latin America and other countries.

ALGERIA—Sergent and Béguet (131) reported the results of tests made in Algeria with the two louse powders MYL and DDT. These tests were conducted cooperatively by the International Health Division of the Rockefeller Foundation and the Pasteur Institute of Algeria from June 1943 to January 1944. The results were so favorable that recommendation was made to dust all the inhabitants in a locality with powdered insecticide when a case of typhus appears.

Argentina.—Hayward (85) reported that "Gesarol" is successful in controlling whiteflies on citrus. It may be applied as a dust or as a spray suspended in water at a concentration of 1 per cent. Another suitable spray consists of 2 liters of white, medium-light emulsible oil containing 30 to 40 grams of "Gesarol" and 98 liters of water.

Australia. — Norris (112) reported on tests for the evaluation of DDT as a fungicide. The results of all trials showed that, with the range of organisms used, DDT was of no value whatever as a fungicide. Agar plate tests were made in the laboratory with the fungi *Ophiobolus graminis* Sacc., *Colletotrichum trifolii* Bain and Essary, *Pleospora herbarum* Pers., *Ascochyta imperfaceta* Peck, and *Pseudoplea trifolii* (Rostr.) Petr. The DDT was placed on the agar in the form of a 1 per cent solution in alcohol. All fungi grew impartially over all the plates. Seeds of commercial Greenfeast peas were treated with DDT-kaolin dusts at the standard rate of 2 ounces per bushel. These dusts contained 0.1, 1.5 and 50 per cent of DDT. The seeds were planted in soil heavily infested with unspecified damping-off organisms, and after 14 days the emergence of the DDT-treated seeds was no better than that of untreated seeds, whereas the emergence of seeds treated with "Spergon" (tetrachloroquinone) was 86.5 per cent. Even undiluted DDT was ineffective in preventing infection of wheat with flag smut, *Urocystis tritici Koern.*

Burnet (47), director of the Eliza Hall Institute of Research, Melbourne, in May 1944 addressed the chemical institute of that city on the subject of DDT. Special reference was made to the work of Boyce in California with DDT against red scale. Attention was called to the stability of DDT, as shown by the retention of effectiveness of mosquito netting for several weeks after having been sprayed with DDT.

Wilson (154) published a plea for DDT supplies to control pests.

Brazil. — Lent and Oliveira (95) described the results of laboratory tests of "Neocid" (5 per cent of DDT in talcum powder against Hemiptera of the family Triatomidae. These insects, *Rhodnius prolixus* Stal, (*Panstrongylus*) *Mestor megistus* (Burmeister), *Triatoma sordida* Stal, and *T. infestans*, (Klug) are transmitters of the American trypanosomiasis (Chagas disease). DDT is slow in its action and does not prevent the hatching of eggs. The last larval stages of the insects are most resistant. The adult insects first show the effect of DDT in the hindlegs. Paralysis affects one side of the body with the result that the insect walks

in circles with the affected side lowered, and in its attempt to straighten up turns completely over on its back. The abdomen rapidly distends and becomes tense. The insects continue to live for a few days stretched out on their backs with a disordered motion of the legs.

Pigeons Found Susceptible

LENT and Oliveira also fed pure DDT, synthesized in the United States, to pigeons and permitted these insects to feed on the treated birds. The pigeons showed no abnormal effect when fed DDT in amounts up to 0.4 gram per pigeon of normal weight (350 grams), but doses of 0.45 and 0.50 gram caused trembling which persisted for days and sometimes caused death. *Rhodnius prolixus,* 2 hours after sucking blood from these pigeons, showed the usual symptoms of DDT poisoning.

According to Dean (66), the Department of Health of Sao Paulo has been experimenting with the use of DDT against mosquito larvae since December 1943. The species used in these tests include *Anopheles albitarsis* (L.—Arr.), A *strodei* (Root), *Anopheles* sp., *Culex quinquefasciatus* (Wied), and *Culex* sp. The DDT was dissolved in an organic solvent and added to water to make concentrations ranging from 1 to 1,000 to 1 to 60,000,000. This department recommends a concentration of 1 part of DDT in 25 million parts of water, although a solution half as strong will eliminate all larvae within 36 hours. One application lasted 4 months. DDT does not repel mosquitoes nor prevent egg deposition, but the larvae died immediately upon leaving the eggs in the treated tanks. DDT adsorbed on powdered cork, ashes, and sawdust was also applied to water surfaces, but the time required to kill the larvae was greater than in the case of the colloidal solutions.

LePage and Giannotti (96) reviewed the work of Annand and staff (43) with DDT. They (97) also tested pure DDT and "Gesarol P" and "Gesarol A" (3 per cent of DDT in each) on rabbits, 1 month old chickens, and hens. A rabbit fed a total of 2.64 grams of pure DDT over a period of 17 days gained about 10 per cent in weight. Chickens ingesting 100 mg. of "Gesarol A" daily presented no abnormal symptoms and after 40 days showed no sign of toxication. Hens fed for 30 days on millet treated with "Gesarol P" (12 grams per 60-kg. bag) showed no signs of poisoning. One gram of pure DDT dissolved in castor oil was administered to a hen of 1.5 kg. weight, with no bad effect. DDT was found effective against white flies, houseflies, bean weevils, rice weevils, and mealybugs.

Experiments carried out with DDT to determine its possible toxic effect indicated that the human organism is not harmed by it, at least not in the highly diluted state in which it is used in exterminating larvae in water deposits, and that consequently it can be used in waters destined for human consumption. DDT was administered intravenously, intramuscularly, and orally to mice, rats, guinea-pigs, cats, pigeons, and hens, and to all practical purposes proved quite harmless. It was tested on several species of aquatic plants, and no detrimental effects were observed. In most of the experiments on certain common species of fish there was no effect whatsoever. Tests involving the direct application of pure DDT, as well as ointments and watery colloidal solutions containing up to 5 per cent of the compound, on the skin and conjunctive of laboratory animals and on the skin of man demonstrated no signs of local irritation.

Vaz, Pereira, and Malheiro (138), of the University of Sao Paulo, reported that calcium gluconate (10 per cent solution) injected intravenously acts as an antidote to DDT poisoning in dogs. The animals were fed 10 per cent oily solutions of DDT, at dosages of 150 to 200 mg. of DDT per kilogram of body weight. These investigators suggest, on the basis of the satisfactory results obtained in prevention and treatment of dogs experimentally intoxicated by DDT, that the apparent neurologic symptoms observed are consequent to hypocalcemia and not due to direct action of DDT upon the central nervous system.

Wasicky and Unti (139) reported on tests made with DDT on mosquito larvae. One part of DDT to 20 million parts of water killed all culicine larvae in less than 8 hours but did not prevent the adult females from ovipositing. Tests were made on dogs, cats, rats, rabbits, guinea pigs, white mice, pigeons, chickens, frogs, toads, and three kinds of fish, from which it was concluded that doses of DDT effective against mosquito larvae are nontoxic to man and domestic animals and are devoid of smell and taste, properties which make possible its application to reservoirs of water.

Leslie (98,99), of the American Emassy, Rio de Janeiro, has reported on the sale of DDT insecticides in Brazil. No DDT is manufactured in Brazil but the Swiss product is imported and marketed by the Companhia de Anilianas e Produtos Quimicos Geigy do Brasil, S. A., under the trade names "Anofex," "Gesarol", "Gesapon", "Gyron", "Ixodex", "Neocid", and "Neocidol". Dean (66), of the Sao Paulo American Consulate, reported that "Gesarol M" containing 10 per cent of DDT was to be sold in the Sao Paulo market. This information on trade-marked insecticides containing DDT has been summarized by Roark (117).

DDT Use In Canada

THE publicity concerning DDT in Canada has followed closely that in the United States. The first articles on this subject were those by Twinn (137), Emslie (68-72), and Stanford (132). These writers speak of the high toxicity of DDT to lice, houseflies, and bees, and record that the insecticide is being manufactured on a small scale in the United States.

Blauvelt (44) called attention to work by Dustan in Canada which indicated that DDT in certain spray formulas is very effective against the greenhouse leaf tier and the chrysanthemum thrips but not satisfactory against the red spider mite and mealybugs.

An anonymous writer (12) stated that "marvelous results" in freeing large areas along the Alaska highway in northern Alberta from mosquitoes had been achieved by spraying DDT from airplanes. DDT is being tested against spruce budworm in Canada.

Cameron (48) published a general account of DDT, its preparation, trademarks and patents covering it, its use in louse powder, against flies, fleas, and other insects, and its pharmacology.

Proulx (115) called attention to the published results of tests with DDT against numerous insects, especially the tests by the United States

Bureau of Entomology and Plant Quarantine, and made a plea that the Canadian entomologists try DDT for the control of insects attacking animals.

Breckenridge (46) described his manufacture of DDT according to Zeidler's procedure. The yield of crude product (initial softening point 75°C.) was 7 pounds from 5 pounds of chloral hydrate, or about 65 per cent. This material, of which about 250 pounds was produced, was used in small field tests against the spruce bud worm and the spruce sawfly by the Provincial Department of Lands and Forests, Ontario. A portion of this crude DDT crystallized once from anhydrous ethanol had a melting point of 105.5-106°C.

DDT found effective in controlling California red scale, according to experiments in that state. Workers report no harm to tender plants.

Daviault (65) reported briefly the results of tests made in the summer of 1944 with DDT for the control of the spruce budworm in Algonquin Park, Ontario. The material was applied from an American biplane which flew over the forest about 25 feet above the top of the trees at a speed of 80 miles per hour.

Craik (64) wrote a popular account of DDT and reported that in experiments made late in July by the Ontario Department of Lands and Forests, in which edges of a river and a lake were sprayed with DDT, the fish apparently suffered no ill effects although crabs succumbed. Fish are known to die if they swallow insects which have been killed by DDT. Inasmuch as fish do not feed on surface insects at certain periods of the year, it would be possible to use DDT as an insect killer at these periods without harmful effect on the fish.

Ross (124-126) has not only written popular accounts of DDT, but has also summarized all the Canadian work that has been done to determine the insecticidal value of this product. The first summary (122) covers the period of February through May, 1944; the second report (123) covers the entire year. These two reports describe tests against 67 species of insects and contain too much informtion for abstracting in a brief review such as this one.

DDT In Other Countries

Chile.—The Chilean Department of Agriculture (62) called attention to the recent introduction into that country of a liquid insecticide consisting of DDT dissolved in mineral oil and warned that if used on plants the oil might severely injure them. DDT has been tested in Chile and promises to be of great value for controlling agricultural insects, but because of its toxicity to man it should not be allowed to contaminate foods. Tests have been made to find solvents for DDT which are not injurious to plants.

Rosenberg (120) published a report on work he did at Riverside, Calif., from October 1943 to February 1944, with insecticides for the control of the California red scale. A solution of 6 grams of DDT per 100 ml. of oil emulsified in water (1.75 per cent) was exceptionally effective. Rosenberg (121) also reported that in preliminary experiments *Strangaliodes albosquamosus* (Boh.) and related species, commonly known as "capachos" in Chile, have been killed on grape vines sprayed with an emulsion containing 0.2 per cent of DDT. A dust containing 1 per cent of DDT was not so effective as the liquid form. The insects died in 3 or 4 days but in 12 to 24 hours were unable to feed. Insects kept on sprayed plants for 24 hours and then transferred to untreated plants failed to survive.

Colombia.—A popular article was published anonymously (10) in the Revue Nacional de Agricultura.

Cuba.—Two popular articles on DDT by Gutierrez (85) and Peede (114) describe the use of DDT against lice, malaria mosquitoes, bedbugs, houseflies, cockroaches, and other insects.

Denmark.—The state agricultural experiment station (67) published a report on tests of "Gesarol" powder against *Phyllotreta* spp., *Meligethes aeneus, and Byturus tomentosus* [(Deg.)] and Olsen (113 discussed the control of flies with DDT insecticide.

Fiji.—Lever (100) briefly reviewed the use of DDT against typhus-carrying lice in Naples, bedbugs in barracks, flies in stables, and other insects. He also recorded the results of his tests with DDT as a mosquito larvicide (101). Tests were made against larvae in trays, tubs, and swampy ground. The species were *Aedes vexans* [(Meigen)]. *Aedes pseudoscutellaris* [(Theob.)] *Culex fatigans* [Wied.], and *Culex annulirostris* [Skuse]. DDT was applied as a 5 per cent solution in oil and as a dust mixed with soapstone (1:9). One quart of 5 per cent solution of DDT in oil was found to be as effective as 10 to 14 gallons in oil alone. It was concluded that DDT is quite suitable as a mosquito larvicide in Fiji with its rainfall of 120 inches per year and a humidity of 74 to 84 per cent.

India.—Ananda Rau (42) published a popular article on DDT.

Mexico.—Colorado and Leyva (63) published a note on the preparation of DDT. A small quantity, synthesized in the laboratory according to Zeidler's procedure, had a melting point of 107° C. after recrystallizing from alcohol.

Panama.—The Gorgas Memorial Laboratory (81) tested a 2½ per cent solution of DDT in kerosene against sandflies *Phlebotomus*, of which 20 species were distinguished. Two houses were sprayed inside and out, but the results, although apparently favorable, were inconclusive because the tests were interrupted. Tests were made with DDT in both dusts and in oils for the control of *Anopheles albimanus* [Wied.] and *A. triannulatus* [(Neiva and Pinto)]. Dosages as little as 0.02 pound of DDT per acre in dust and 0.01 per acre in oils or emulsion gave nearly perfect kill of anopheline larvae in 24 hours provided that weather con-

ditions were optimum. DDT dusts or oils, unless applied in very heavy doses, were ineffective in controlling culicine larvae, but DDT in emulsion was equally effective against culicines and anophelines.

Peru.—The sole news item on DDT in this country appeared in the Lima daily, *La Prensa*, of August 3, 1944. Transmitted from London by Reuter's (116) news service, it calls attention to the value of DDT against lice, mosquitoes, flies, and other insects, and gives credit to British scientists for discovering it.

South Africa.—Hepburn (87) reported that tests had been made in Pretoria with a weak solution of DDT against the Bagrada bug, a common pest of cruciferous plants. The DDT, which had been prepared in the local chemical laboratory, proved highly toxic to these bugs. Sealy-Fisher (130) published a short history of DDT with special reference to its value to the farmer. Morgan (108) wrote a short article on DDT for the benefit of citrus growers.

Sweden.—Jarl (91) reported that "Gesarol M," containing 10 per cent of DDT, had proved effective against houseflies and stableflies in tests made at the State agricultural experiment station. One can of this product in 40 liters of water was applied with an ordinary knapsack garden sprayer at the rate of 1 liter per 4.5 square meters. One spraying lasted for about 3 weeks in warm weather and about 6 weeks in cool weather. Reference was made to tests carried out in Denmark with an effective mixture of 3 parts of "Gesarol" and 97 parts of whitewash.★★

References were published with Part I, in our July issue.

SABADILLA

(*Continued from Page* 21)

rum or rotenone, it is not as great as that of DDT. Consequently, for the most effective control, the plots must be closely watched to insure proper application. Tests to date indicate that sabadilla seems to be most efficacious when applied at a time when the temperature is around 100° F. or higher.

Since the field trials on sabadilla dusts revealed that this form of the insecticide had a wide and varied practical application, attention was again given to the toxicity of sabadilla to the warm blooded animal. In two series of experiments on rats the irritating and/or toxic effects of sabadilla and rotenone dusts were compared. The animals were subjected to various concentrations of the dust suspensions from once to six times per day for one to two weeks or until death occurred. The sabadilla dust treatments caused temporary irritation, and no deaths occurred at any level investigated. The growth rate of the rats was almost normal during the sabadilla treatments. The rotenone dusts were on the other hand definitely irritating and caused injury to the eyes. The rats failed to gain weight and at the higher concentrations of rotenone dust lost weight before succumbing to its effects in eight days.

ANOTHER series of experiments on rats was recently completed wherein the toxicity of heat treated sabadilla seed, the isolated crude sabadilla alkaloids, rotenone, and DDT were studied. These insecticides were incorporated in a basal ration complete in all respects. After several trials at various levels of intake certain definite conclusions could be drawn. It was found that DDT was the most toxic insecticide studied. Rats receiving as little as 0.625 per cent DDT in the diet displayed extreme restlessness accompanied by tremors resulting in death in three to five days from what appeared to be nervous exhaustion. Surprisingly, rotenone, which is usually considered as a safe insecticide, also proved to be very toxic to the rat. Its toxicity was found to be slightly less than that of DDT as concluded from the observation that at the same level of intake, i.e., 0.625 per cent, the life span of the rats receiving rotenone was extended to seven to nine days. The rats on the rotenone-supplemented diets also displayed restlessness but no indication of tremors was observed.

Both sabadilla seed and the alkaloids per se were definitely less toxic than either rotenone or DDT. It was found that the toxic level for sabadilla seed was slightly less than 2.5 per cent and that for the isolated alkaloids in excess of a 2.5 per cent equivalency. These observations led to the conclusion that although sabadilla seed is irritating and toxic to the warm blooded animal its toxicity is less than that of rotenone or DDT.

The most recent chemical investigations on the alkaloids of sabadilla seed indicate that the greater part of the toxicity is confined to the two alkaloids, cevadine and veratridine. Experiments with these two alkaloids both in a dust form and in kerosene solutions revealed cevadine as the more toxic. These toxicity studies were performed on the milkweed bug and the red-legged grasshopper. Under identical conditions DDT was far less toxic than either cevadine or veratridine. Further studies on the chemistry of the toxic alkaloids are still in progress.

Although the present data indicate that sabadilla is limited in its uses, it has a niche all its own in the insecticide field. Its possibilities have not been exhausted as yet. Considerable work is underway or planned for the coming seasons, and excellent possibilities are foreseen for the use of the sabadilla dusts and sprays as well as for the isolated toxic alkaloids. At the present time sabadilla dusts of various concentrations and combinations are being manufactured and are available throughout the United States.[4] Preparations of sabadilla for use as sprays are expected to be available in 1946.

[4] Manufactured by McConnon & Company, R. J. Prentiss Co., and John Powell & Company, Inc., under license from the Wisconsin Alumni Research Foundation.

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Beetle Bulletin Out

Availability of Station Circular No. 159 on the "Striped Cucumber Beetle" is announced by the New York State Experimental Station, Geneva. It describes the habits of the beetle, its appetite for cucumbers, muskmelons, squashes and pumpkins, and the fact that in addition to its destructive eating, it also spreads bacterial wilt and certain mosaic diseases. Control methods are described.

Comments....

By Dr. Alvin J. Cox

This column by Dr. Cox will appear from time to time as a feature of AGRICULTURAL CHEMICALS. Dr. Cox formerly was successively Physical Chemist, Chief Chemist, Assistant Director, and Director of the Bureau of Science, Government of the Philippines. He was appointed Chief of the Bureau of Chemistry, California State Dept. of Agriculture in 1932 and retired in 1945.

CONSISTENT enforcement of good laws and regulations is in many ways an aid to legitimate business. Unreliable merchandise soon not only destroys its own market, but injures that of properly labeled, reliable products. In my administrative experience, I have called many industry meetings out of which I received the confidence and counsel of those attending. It took years of study to evolve the article entitled, "Economic Poisons: California Law and its Administration", published in *The Bulletin*, 1944, Volume 33, No. 2. Department of Agriculture, State of California. I shall endeavor to supply a copy to any state economic poisons administrator who has not seen it or does not have access to it.

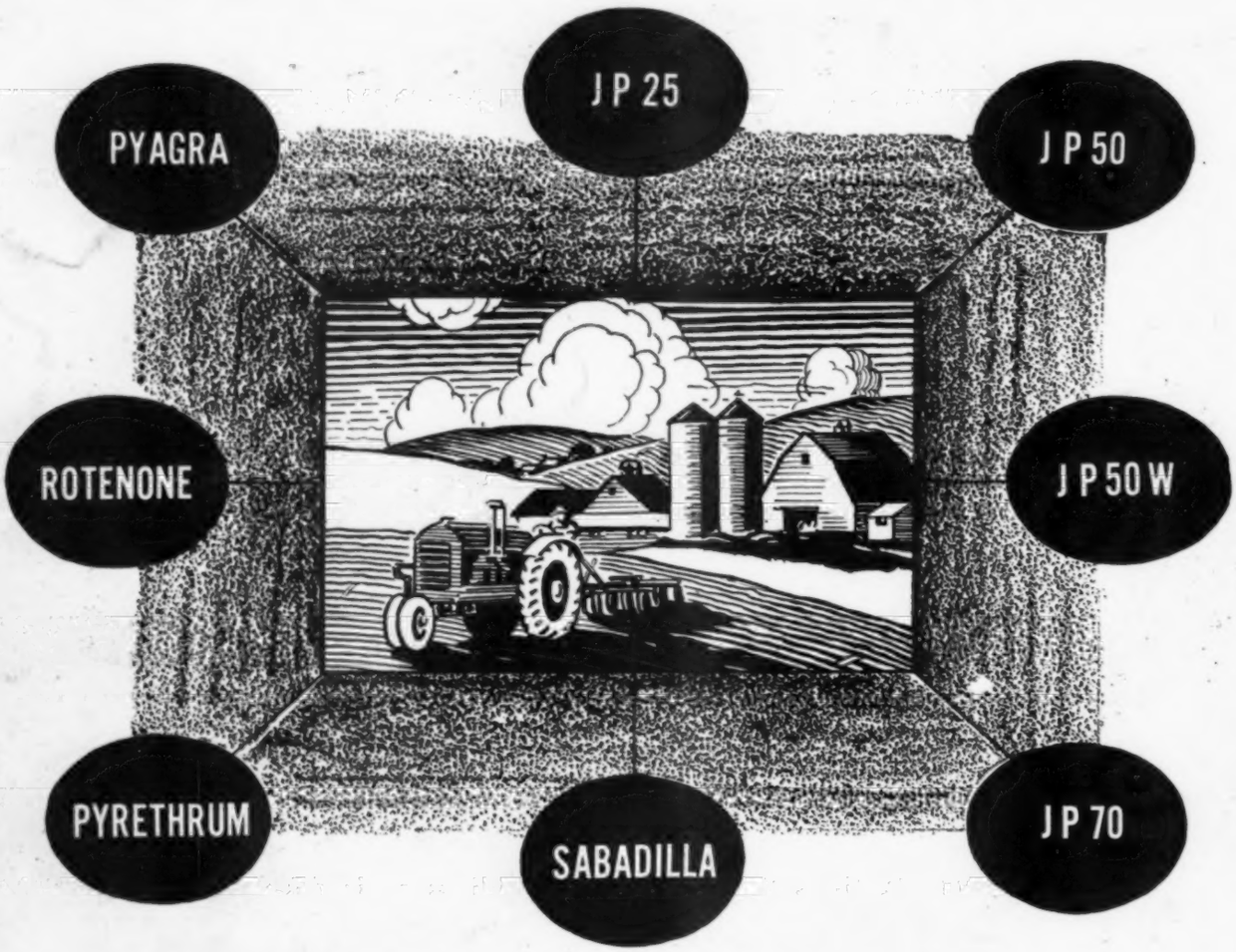
California produces 90 per cent of the kinds of crops grown commercially in these United States, hence uses a comparatively large quantity of agricultural chemicals sold to farmers. For that reason, the state has had to maintain a consistent point of view in dealing with a very large number of related but dissimilar economic poison products, and has tried to permit the greatest latitude in honest labeling and advertising except where such would start a battle of competitive phases. A state with fewer crops does not need to increase its requirements to the point of a separate label. To do so unnecessarily inconveniences manufacturers doing business on a national basis.

Confusion of every kind must be avoided. Until one has had the experience, he does not know how difficult it is to make a change without having many upsetting reverberations. I recall a proposed regulation relative to labeling certain tar oils and other oil residues which provided that the labels should show admixed petroleum oils as an inert ingredient. The next day, a protest was received from a manufacturer who was marketing a foliage oil spray, containing 2 per cent of creosote. The regulation would have reduced his product from active ingredients 100 per cent to active ingredient 2 per cent. The situation was promptly remedied by adding the words, "unless the product is sold solely as a contact insecticide."

Legislators and administrators unfamiliar with such problems may merely complicate the troubles they seek to cure by change, not to mention unnecessary increased requirements which a conscientious administrator seeks to avoid. Basic uniformity of legislation for guidance of all official agricultural regulatory agencies is very desirable. The increase of commerce among the states and the expansion of science into legislation, makes uniformity virtually mandatory in order to permit one engaged in interstate commerce to meet the otherwise conflicting provisions of varied state statutes. The principles underlying the labeling laws, namely, advice to, and protection of, the consuming public readily permit of such uniformity. The proposed Federal Insecticide, Fungicide, and Rodenticide Act should provide the way to dispense with existing State conflicts of law and regulations. Insofar as possible, Federal and State Departments of Health, State Boards of Pharmacy, Federal Trade Commission, and other Agencies should cooperate in the interests of uniformity.

For many years the legal profession has encouraged uniformity of laws on certain subjects in all states. Laws on the subjects of sales, conditional sales, partnership, limited partnership, stock transfer and many other subjects have been drafted by the National Conference of Commissioners on Uniform State Laws and have been incorporated in the statute books of many states. A good example of the results obtained by efforts of national groups in promulgating uniform laws is the statute known as the "Fair Trade Act" which permits a manufacturer to designate the resale price of his branded articles. This law drafted by a national association of wholesalers is now part of the statutes of forty-six of the forty-eight states and has become part of the federal law by the Miller-Tydings amendment to the Sherman Anti-Trust Act.

The *Journal of Economic Entomology* (1944) Vol. 36, pp. 813-21 published my paper entitled, "Terminology of Insecticides, Fungicides and Other Economic Poisons." There is familiar experience back of the nomenclature defined therein, of special interest to entomologists, plant pathologists and manufacturers. Confusion of terms unfortu-



FARM SCENE - POWCO BRAND STYLE

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Powco Brand JP #25 is a liquid, water miscible DDT spray concentrate containing 25% by weight of technical grade DDT combined with a hydrocarbon solvent. It is particularly adaptable for use where a water base spray is recommended. For example:

1. Dairy and Barn Sprays.
2. Animal Sprays and Dips.
3. Poultry House Sprays.
4. Swine and Swine House Sprays.
5. Mosquito Sprays and Larvacides.
6. Horticultural Sprays.

Powco Brand JP #25 is easy to use—merely mix it with water. It forms a creamy, stable emulsion and works well in all types of water. It is bland in odor, light in color and has a high flash point.

Powco Brand JP #70 is a water miscible agricultural spray concentrate containing 70% by weight of DDT isomers combined with a hydrocarbon solvent plus 6% of a special emulsifying agent. JP #70 kills Colorado potato beetle, potato aphids, potato flea beetles, potato leafhopper, the common cabbage worms and certain other defoliating insects.

JP #70 has been used on thousands of acres of potatoes with good results. It gives high aphis control. It eliminates danger of injury to crops due to reduced amount of solvent used. It is compatible with copper and organic insecticides. JP #70 means increased yields because of better insect control.

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STABLE FLY

BUG OF THE MONTH

Dairy farmers are well acquainted with the Stable Fly—the bug for the month of August. Wettable DDT Powder applied to livestock as a spray or a dip has a remarkably long residual action against the Stable Fly. Water type sprays or residual oil type insecticides containing DDT applied to areas where Stable Flies rest are very effective in reducing the population of this insect on dairy farms. We suggest that you investigate PRENTISS MICRO-MESH WETTABLE (50% DDT Powder), PRENTISS 30% DDT OIL CONCENTRATE, PRENTISS 25% WATER MISCIBLE DDT for use in your products for the control of Stable Flies and other livestock pests.

It will also pay you to investigate these other PRENTISS basic insecticides.

(1) MICRO-MESH DRY (50% DDT Powder) a concentrated powder containing 50% DDT. Used for mixing to compound DDT powders that can be used as agricultural dusts, mosquito larvacides, louse powder, etc.

(2) PRENTISS #10 CONCENTRATE, a liquid concentrate containing 50% by weight of mixed DDT isomers, for use in manufacturing residual insecticides containing DDT isomers.

(3) PRENTISS CUBE POWDER, finely milled, uniformily batch-mixed and tested.

(4) PRENTISS PYRETHRUM POWDER, a specific for many agricultural pests. Finely ground and adapted for agricultural dusts containing pyrethrum.

(5) PRENTISS PYRETHRUM CONCENTRATE, still the most economical basic raw material for contact sprays when performance is considered of primary importance.

Look to PRENTISS for the latest developments in basic agricultural insecticides. R. J. PRENTISS & COMPANY, INC., 110 William Street, New York 7, New York, 9 So. Clinton St., Chicago 6, Ill. Plants: Brooklyn, New York and Newark, New Jersey.

PRENTISS

RAW MATERIALS FOR AGRICULTURAL INSECTICIDES

The Listening Post

This department, which reviews current plant disease and insect control problems, is a monthly feature of AGRICULTURAL CHEMICALS. The following comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey. The following summary of their most recent reports was prepared especially for this magazine.

By Paul R. Miller

LOSS of tomato fruit by mold invasion of fruit cracks during the latter part of the season when rains are frequent has concerned a number of canners in New York State. This loss cannot be controlled effectively by protective fungicide sprays. An experiment designed primarily to determine the effect of several synthetic growth hormones of the ripening of tomato fruit indicated that applications of 2,4-D reduced the amount of fruit cracks and subsequent mold development.

On August 27, several synthetic hormones including 2,4-D at varying concentrations were sprayed on previously non-sprayed tomatoes. The daily mean temperature for the period between application and first picking varied from 62.5° to 79° with a mean of 74.2°F., and the sky was clear on all but 4 of the 13 intervening days.

Rains delayed the next harvest until September 29. During this period precipitation occurred on 10 days and totaled 7.7 inches. Observations at the second harvest indicated very little cracking of the fruit on the plots sprayed with 2,4-D at a concentration of 1,000 ppm. Counts made of the total number of fruit, ripe whole fruit, ripe cracked fruit, green fruit, and sun-scalded fruit in control plots and those treated with 1,000 ppm. 2,4-D showed considerably less cracked fruit in the 2,4-D treated plots but little difference in the amount of sunscald or degree of ripeness. Virtually all of the cracked fruit was so overrun by molds as to render them unfit for picking, whereas the whole fruit in the 2,4-D sprayed plots was firm and suitable for canning except for a heavy infection of anthracnose. These plots, however, had not received any fungicidal application and the anthracnose was equally severe in all plots regardless of treatment. It is suggested that 2,4-D treatment may prove useful in controlling losses due to fruit cracks, especially in wet seasons, and that further investigation is warranted.

A number of tobacco growers in one Kentucky County reported that tobacco seed sowed early in March had failed to germinate by early April. A second sowing about the second week in April failed to germinate despite favorable conditions. Upon investigation it was found that all of the growers who reported failures used one brand of a mixed fertilizer purchased from the same dealer. On the surface of the soil of the seed beds, where the tobacco seed failed to come up, there were numerous black spherical pellets 1/16 inch in diameter. An analysis by the Department of Feeds and Fertilizers showed that the fertilizer used contained over five per cent calcium cyanamid. Most of the growers had mixed the tobacco seed with this fertilizer for ease of sowing. The rate of application to the soil was about 30 to 100 pounds of mixed fertilizer or 7½ to 25 pounds of calcium cyanamid per 100 square yards.

On tobacco beds treated with this fertilizer, containing calcium cyanamid, the few weeds present, mostly along the margins, were either much yellowed or partially withered. Knotweed, narrow-leaf plantain, and cheesemallow plants had necrotic lesions, one-half to one inch long, on the stem below the soil surface. Below this depth, apparently in soil free of fertilizer, the roots were normal. Small crabgrass plants were killed by the fertilizer.

It was reported that one grower used this fertilizer to top dress a winter cover crop of vetch and rye. All of the vetch was killed and the rye was damaged. Another farmer reported that he killed radishes, lettuce, and tomato plants with the fertilizer.

Insect Conditions During Early July

By G. J. Haeussler

This column is prepared especially for readers of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U.S.D.A. His observations, based on latest reports received by the Bureau from collaborators all over the country, will be a monthly feature of AGRICULTURAL CHEMICALS.

DEVELOPMENTS with regard to the more important insect pests requiring chemicals for control, as recorded during the month of July, are summarized below.

The boll weevil situation continues critical in most weevil-infested counties from the Atlantic Coast to Central Texas. Weather conditions generally remained highly favorable for development of the weevils in many areas. Hot, dry weather during the second and third weeks of July helped check them somewhat over large areas of Texas and Oklahoma, but local rains in many places and mild temperatures in the Atlantic Coast States were favorable to the weevils. By July 20, infestations were found in all fields examined in South Carolina and Georgia, but few fields had over 50 per cent of the squares punctured. In the cotton-growing States to the west—especially in Louisiana, Texas and Oklahoma—a much larger proportion of the fields had more than 50 per cent of the squares punctured. Those interested in boll weevil control are reminded that much can be accomplished in reducing losses due to the weevil, increasing yields, and improving the cotton quality by dusting late in the season even though no

early dusting was done. Many bolls and locks can still be saved.

By July 20, the cotton fleahopper was about out of the picture as a damaging insect in Texas. Fleahoppers were present in damaging numbers in Butts and Henry Counties of Georgia during the first week of July and were still on the increase the following week in southern Oklahoma, with damaging numbers present in McCurtain and Pittsburg Counties.

The cotton leafworm situation had not become serious although reported from 23 counties of Texas by July 20. Infestations are now scattered throughout southern Texas and as far north as Waco. By the end of July the leafworm infestations were severe in Louisiana.

Bollworm in Cotton

BOLLWORM infestations are widespread on cotton throughout central Texas and some dusting is being done for their control. Infestations are developing in both early and late-planted cotton, and damage is reported as medium to heavy in many fields. Scattered light to heavy infestations occur in the Coastal Bend area and extend to north Texas. They are also generally distributed over Georgia and have caused some damage in local areas. Heavy losses were being caused by the insect in Louisiana by the end of July.

Much dusting has been done for the control of stinkbugs, *Lygus* bugs, and other hemipterous insects that attack cotton in the irrigated sections of the Southwest in the Salt River and Santa Cruz Valleys and in the Casa Grande area of Arizona.

The danger of injury from larvae of the first brood of the codling moth was largely over in most areas by early July. Moths of the second brood were appearing in most areas by about the middle of the month or shortly thereafter but little activity by larvae of that brood has yet been reported.

The plum curculio infestation in Elberta peaches was reported as heavy in the Fort Valley area of Georgia and this insect was serious late in July in some peach orchards in western Kentucky and southern Illinois.

Cabbage caterpillars continued to cause moderate to heavy damage to cabbage and related crops throughout July in much of the North Atlantic and Gulf Coast region from New York to Alabama and also in Utah and Idaho. Light to moderate infestations occurred in Maine, Maryland, northwestern Tennessee, Ohio, and southern California.

Vegetable Pests Abound

MODERATE to heavy infestations of the tomato fruitworm have prevailed in Georgia, throughout July. This pest has been reported in light to moderate numbers from New Jersey, Maryland, Virginia, South Carolina, Florida, Alabama, Ohio, and Utah. The tomato hornworm caused severe injury to tomatoes in some sections of Florida about the middle of the month. Cucumber beetles have been numerous during July in New York, New Jersey, Maryland, Virginia, Georgia, Florida, Tennessee and Louisiana; and the pickleworm was reported causing serious damage in Virginia, South Carolina, Georgia, and Alabama.

The velvetbean caterpillar was found to be present in limited numbers the second week of July on soybeans at Napoleonville, La., the infestation extending south and west of St. Mary Parish. This insect also began to cause noticeable damage to peanuts in some sections of Jackson County, Fla., during the latter half of the month. The threat of severe damage was such that steps were being taken to have adequate supplies of insecticide on hand to combat the infestation.

The Mexican bean beetle has continued in moderate to heavy infestations in many of the North Atlantic and Gulf Coast States and has also been present in damaging numbers in northwestern Tennessee and in northern Utah. Light to moderate infestations have prevailed in Maine, New York, Maryland, Mississippi, Ohio, Nebraska, and Wyoming. During the third week of July this insect was reported infesting 1,100 acres of beans in Ventura County, California.

Infestations of the potato leafhopper increased over those of last month and the insect was reported as abundant or unusually so on beans in New York, New Jersey, Maryland, Virginia, South Carolina, Georgia, northwestern Tennessee, and Wisconsin. It was also numerous on potatoes in New York and southern Wisconsin.

Flea beetles caused damage throughout the month to young turnip greens in eastern Virginia.

The apple aphid was fairly active during July in some counties of western New York and continued fairly abundant, though not especially injurious, in the vicinity of Yakima, Wash. The rosy apple aphid remained quite common on apple at Yakima due to continued cool weather, but was of little importance in most other apple growing areas during the month. The woolly apple aphid became rather abundant about the middle of July in the Yakima area on trees that had been sprayed with DDT.

Pea Aphids Infest

THE heavy infestations of the pea aphid reported last month in the Blue Mountain district of eastern Washington and Oregon continued into July and caused severe damage with serious monetary losses despite the fact that most fields were dusted at least once and some fields as many as three times. It is estimated that the aphid reduced the total yields of peas in most fields by about 50 per cent. Severe infestations are continuing in the late pea fields in some parts of the district. This is the third consecutive year of severe damage from pea aphid in the Blue Mountain canning district. The pea aphid infestation in southern Wisconsin declined early in July due to the combination of dust treatments, maturity of the crop, and the increase of natural enemies, particularly fungus disease. Heavy pea aphid populations have developed in some fields of Maine and insecticide applications have been required for this insect on sweet peas grown for seed in south central Idaho.

The British Develop a New Weed Killer

By Paul Duncan
London, England Correspondent
for Agricultural Chemicals

Just as 2,4-D is changing the weed control picture in the United States, "Methoxone" makes a sensation in British Isles through ability to kill toughest weed infestations

WEED eradication is of great importance to every nation, but to no country is it of such importance as in Great Britain where the system of intensive husbandry makes it imperative to utilize every square foot of soil. The great enemies of the British agriculturist are yellow charlock (*Brassica Sinapis*), white charlock (*Raphanus Raphanistrum*), pennycress (*Thlaspi arvense*), field poppy (*Papaver Rhoeas*), corn buttercup (*Ranunculus srvensie*), treacle mustard (*Erysimum cheiranthoides*) and fat hen (*Chenopodium album*). In addition to these there are such common weeds as corn marigold, speedwell, chickweed and sow thistle.

Work was begun on methoxone (2-methyl-4-chlorophenoxyacetic acid) in Great Britain began in 1940, but it was not until 1945 that field tests were carried out by Plant Protection Ltd., a subsidiary of Imperial Chemical Industries Ltd., in co-operation with every War Agricultural Executive Committee in the country. In addition to this work, Plant Protection Ltd., laid down controlled experiments at 111 centers in 23 counties of England, Wales and Scotland. These experiments covered over 1,000 acres, which for a small country like Britain is quite considerable. The complete series of experiments was the largest ever undertaken in Britain on an agricultural problem. In all over 1,000 centers involving a total of some 13,000 acres were under treatment.

Methoxone dusts were used throughout the British experiments as more farmers were equipped to apply dust rather than sprays. An analysis of the results of the tests showed that of the 50 weeds commonly experienced, five of the most damaging found among cereal crops were killed outright, 6 were seriously affected and a large percentage of the remainder affected in varying degrees. The accompanying list shows at a glance the effect of the weed killer.

No damage to cereal crops by the presence of methoxone dust was detected except in a small number of cases where in barley fields it was noticed that some malformed ears were grown. This selective herbicide or weedkiller is harmful to Brassicae and some root crops and throughout the field tests care had to be taken to see that it was not carried by wind drift to fields where cabbages, turnips, etc., were growing.

The fact that methoxone dressed crops yield an increase of 22 per cent is of great value and interest to British farmers today, as well as to the British Ministry of Agriculture faced with an acute shortage of cereals. Economically there is every justification for the extended use of this weedkiller on corn crops as British fields are small and fairly heavy subsidies are paid for good crops. Needless to say the demand for this new agricultural chemical exceeds the supply and every effort is being made to step up production.★★

Killed Outright*	Seriously Affected	Affected	Unaffected
Yellow charlock	Corn marigold	Bindweed	Bladder campion
White charlock	Fat hen	Spurrey	Coltsfoot
Corn buttercup	Speedwell	Thistles	Clevers
Creeping buttercup	Chickweed	Mayweed	
Pennycress	Poppy	Polygonum spp.	
	Sow thistle	Dock	

* It is important to note here that the weeds "killed outright" are the most important experienced by the British farmer growing cereal crops.

Sanitation
PAYS BIG DIVIDENDS ON THE FARM, TOO!

Today, more than ever before, the American farmer is sold on insect control and other sanitary measures. Here indeed is a ready market which the progressive distributor and jobber cannot afford to overlook.

Since we have long specialized in the formulation of agricultural chemicals, we are able to offer laboratory facilities and experience that are unsurpassed in this field.

SCIENTIFICALLY FORMULATED PRODUCTS FOR A WIDE VARIETY OF FARM NEEDS

INSECTICIDES
High powered, effective household, cattle and barn sprays, scientifically compounded. DDT, Pyrethrum and synthetic formulations.

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Modern products for general farm, dairy, hatchery or household use.

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Prompt shipments of either coal tar dips or newly developed water miscible products.

Crude Carbolic Acid
This popular insect destroyer, wood preservative-paint available in 15% and 25% grades.

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For jobbers interested in private brand products, we can formulate disinfectants, insecticides, etc., to your own specifications. Our facilities are at your disposal—no obligation.

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Suppliers' Bulletins

DDT Dust Pamphlet

"Knox-Out Garden Dust," pamphlet published by Pennsylvania Salt Co., Philadelphia, describes the firm's DDT product sold under the trade-name of "Knox-Out." The material is described as being available in single pound sifter cans packed 24 to the case, and in 3 pound bags, 12 to the case. The booklet is available from the Company's Philadelphia offices, 100 Widener Bldg.

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Plane-Spray Folder Issued

Sherwin-Williams Company, Cleveland, has issued a folder describing its hormone product "Stop-Drop" particularly for use in airplane spraying. The four-page brochure presents photos of the spray being applied by plane and gives information regarding the use and chemical properties of the product. It points out in addition to airplane use, the fact that the spray may also be applied from the ground with conventional equipment.

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ANTU Information

Complete information on the rodenticide ANTU is available from John Powell & Company, the company announces. Its product, under the trade name of "Powco Brand Antu", is produced with an eye to getting the maximum toxic activity in baits treated with the preparation, the firm states. An exclusive arrangement has been made with a manufacturer who is basic in the raw materials which is to make the components of ANTU. This, Powell says, enables them to present a chemically refined product of superior quality.

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New Dow Displays

Display stands to exhibit a number of related products to consumers are being put into use by Dow Chemical Co., Midland, Mich. One such display, featuring Dow insecticide dusts for garden protection features the products "Garden Dust," "Rose Dust" and "Rotodow", pointing out literature on the subject and presenting lithographed likenesses of the booklets in natural colors, and shelves on which the packages may be placed for display. The underlying idea is that eye appeal is an asset in more and more retail establishments where self-service is instituted, and that the stand itself should tell the story rather than clerks who might not possess correct information regarding proper use and application of the products. Another counter display directs attention to "Dow Weed Killer" (2, 4-D product), designed to make it easy for the consumer to pick up a package, handle it, read the instructions and decide to buy.

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Pennsalt Insecticide

A pamphlet describing "Indor" insect spray is available from Pennsylvania Salt Mfg. Co., Philadelphia. The product is described as containing 5 per cent DDT, and being designed for either a space or surface spray.

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Powell Presents Pyrin R

John Powell and Company, New York, announces the availability of popular bulletins, technical bulletins and samples of its new product, "Pyrin R", an insecticide concentrate for use in the manufacture of residual type DDT sprays. 'Pyrin R" is described as having been pre-blended and chemically standardized to produce a finished spray containing 5 per cent of DDT and 2 per cent of Improved Pyrin No. 20 when diluted one part "Pyrin R" plus four parts base oil.

Its makers state that the product needs no special weighing or mixing equipment, and at the recommended dilution, the finished spray has a knockdown equivalent to the Official Test Insecticide on flies.

•

Emulsifier Announced

Literite Co., Inc., New York, announces a new emulsifier for DDT solutions. The product is sold under the trade name of "Literite-T", and is designed especially for plant spray formulations and other insecticidal compositions. It is said to produce crystal clear solutions to which any amount of water may be added. Such emulsions are stable under all conditions of use, and the DDT deposited from these emulsions will not be removed by subsequent weather conditions, the company states. The firm is located at 242 West 55th St., New York 19.

•

Issue 2,4-D Dilution Chart

Nox-Weed, Inc., Los Angeles, Calif., has issued a chart covering dilutions of 2,4-D for use in spraying various types of noxious vegetation including loco weed, milkweed, thistle, poison oak, bindweed, and others, along with data on best time of application and a list of precautions in using 2,4-D. George Harmon, head of Nox-Weed which formulates various herbicide compounds, states that they have had unusual success in the control of loco weed on cattle ranges, but that accurate and correct dilution are vitally important. Copies of the 2,4-D dilution chart may be obtained from the firm at 5757 Alcoa Ave., Los Angeles.

•

DDT Emulsion Booklet

DDT emulsion and its uses in food plants or agricultural and dairy buildings are described in a six page leaflet published by Pennsylvania Salt Company, Philadelphia. The booklet gives instructions in applying this 34 per cent solution, one gallon of which the company says will make enough spray to cover 14,000 square feet of surface. Spraying methods are also discussed in the booklet.

Patent Suit Decision

A decision favoring Hercules Powder Co., Wilmington, in the patent suit involving that company, producer of "Thanite" insecticides, and Rohm & Haas Co., Philadelphia, producers of "Lethane" insecticides, was handed down on July 9 by District Judge Leahy in the Delaware District Court. Hercules had sued Rohm & Haas, challenging the validity of the Heckert patent (No. 1,808,893 issued June 9, 1931) and charging Rohm & Haas with unfair competition and violation of the anti-trust laws in the sale of "Lethane" products. Rohm & Haas had introduced a counter-charge of trade-mark infringement, claiming that the use of "Thanite" by Hercules infringed its trade-mark rights in "Lethane."

The decision of Judge Leahy held the Heckert patent invalid and consequently not infringed by Hercules Powder Co. He ruled that evidence did not support the Hercules charges of unfair competition or violation of anti-trust laws, nor did it support the Rohm & Haas counter claim of trade-mark infringement.

•

Morrison Awarded

Kenneth D. Morrison, vice-president of the Davison Chemical Corporation, Baltimore, Md., has been awarded the Brand Names Research Foundation Golden and Centennial Certificates of Public Service in recognition of work done in that field. Mr. Morrison is a contributor to *Agricultural Chemicals*, having written a number of features.

•

Co-op Poster Contest

To stimulate interest in pest control problems among youthful Indiana farm folks the Indiana Farm Bureau Co-operative Association, Indianapolis, has announced a poster contest for boys and girls between the ages of 10 and 20 years. In the design of the poster must be included the words "Farm Bureau Insecticides," the rules provide. County and district elimination contests will be held and at the final state level modest cash awards will be made to final winners.

Prominent in the issue of the Indiana co-op's house organ carrying announcement of the contest were display ads presenting the association's line of "Co-op" dusts and a "Co-op" brand duster. Purchasers receive a free copy of the 'Co-op Pest Control and Garden Guide." presenting data on pest problems of Indiana farmers, prepared in conformity with latest findings of Purdue Agricultural Experiment Station authorities.

•

Dow Personnel Changes

Dow Chemical Company, Midland, Michigan, announces the appointment of W. A. Melching manager of its Dowicide division to take the place of R. C. Harnden who recently joined Chapman Chemical Co.

Dow has also announced the appointment of Kenneth Tyson to be eastern representative of its Agricultural Chemicals division. Mr. Tyson has been with Dow for a number of years.

Insecticide Mixers—

get proven DDT formulations and dependable DDT facts from Geigy

The use of GESAROL* and NEOCID* DDT compositions in your insecticides is assurance that you are incorporating the best possible DDT formulations — formulations which can be extended effectively and economically to the desired strength in both dusts and sprays. They are backed by *proven* performance.

Availability of full cooperation from the Geigy Company, *Originators of DDT Insecticides,* promises assurance of the latest and most authentic facts covering the profitable use of DDT.

In short, *when you deal with Geigy,* products and facts based on nearly eight years of all-out research and development are at your service.

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Geigy can supply GESAROLS and NEOCIDS to meet your rigid specifications covering purity, strength and uniformity. Our sales and technical staff welcome the opportunity to cooperate with you.

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Fertilizer Outlook

By Clifton A. Woodrum
President, American Plant Food Council, Inc.

Fertilizer industry commended for good job done during war. Supply picture is bright despite heavy potential demand.

AMERICAN fertilizer manufacturers again expect to have a record-breaking production for the coming season, which means farmers will have a little more fertilizer than in the 1945-46 period.

Increases in fertilizer production for the coming season are anticipated despite shortages of building materials, machinery, labor, some transportation facilities and difficulties in procuring phosphate rock. Slightly larger deliveries to farmers are expected notwithstanding the fact that unusually-heavy exports will be made to war-torn countries.

Supplies of nitrogen, phosphoric acid and potash, essential ingredients used in the manufacture of fertilizer, will be more than double the 1930-40 average annual consumption. However, world demands still will be in excess of supplies.

USDA officials estimate the 1946-47 nitrogen requirements at 800,000 tons while the total supply for the United States is estimated at 812,933 tons for the coming season, or 487,933 tons above the average annual consumption during the 1930-40 period. Exports for 1946-47 approved by the Combined Food Board will total 97,025 tons, thus leaving the United States and possessions 715,908 tons or about the same as the consumption for the 1945-46 fertilizer year.

Potash supplies for 1946-47 are expected to total 899,582 tons (K_2O) or 571,500 tons above the 1930-40 average annual consumption. Of the total supply during the coming season, the Government has allocated 55,859 tons for export and 77,714 for chemical manufacture, thus leaving American farmers about 766,000 tons compared with the estimated 1945-46 consumption of 740,000 tons. USDA's officials estimate potash requirements for the 1946-47 season at 800,000 tons (K_2O).

Sulphate of potash supplies will be about the same as last year, or approximately 36,000 tons (K_2O).

OPA Fertilizer Prices

The revitalized Office of Price Administration has announced new ceilings on fertilizer importers' prices. Nitrate of soda and nitrate of soda-potash have been increased to $5.50 a ton, bulk and bagged, it says.

Ammonium sulphate is likewise affected by new OPA ceilings. An average increase of about 10 per cent in all but eleven western states has been set as a maximum price, f.o.b. point of production. The new ceiling is set at $30 a ton, bulk.

Phosphate (basis 18 per cent P_2O_5) supplies for the coming season are expected to be about 8,333,333 tons which compares with an annual average consumption during 1930-40 of 3,500,000 tons. Estimated requirements for the coming season are placed at approximately 10,000,000 tons or more than 2,500,000 tons above the estimated consumption for 1945-46. A War Production Board survey shows that the 1945 plant capacity for phosphate (basis 18 per cent P_2O_5) was 11,500,000 tons or 1,500,000,000 tons above the estimated requirements for the coming season. Capacity production can be expected to meet growing agricultural needs just as rapidly as building equipment, labor and phosphate rock bottle-necks are broken.

W. A. Minor, Assistant to the Secretary of Agriculture, complimenting the fertilizer industry on recent production achievements, said:

"Your performance during the war indicates that you are equal to almost any task. Your increases in production were phenomenal. You did all this in the face of undoubtedly the greatest difficulties you have ever encountered . . . and you earned the sincere compliments and regard of the Nation."

Despite war-time fertilizer production achievements officially described by the USDA official as "phenomenal," manufacturers have set in motion an extensive expansion program to meet the growing needs of American agriculture. More than 30 new fertilizer plants were either started during the war or projected for construction by private industry, in addition to the reconditioning and expansion of numbers of other plants designed to increase the production of plant food.

The fertilizer industry is keenly aware of its responsibility in meeting the plant food requirements of American farmers and is not content to rest upon record-breaking, war-time production laurels. Constant efforts are being made to obtain machinery, repair parts, labor, building materials and other essentials for the expansion program.

Phenomenally-large demands for fertilizers in the Mid-west have been recognized in the expansion planning of the industry with the result that a number of plants have been built or projected for construction in the mid-western and west coast states.

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Thanite, Thanasol 70
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For Better

Thanite Proved Under Actual Farm Conditions

Hercules not only tests its toxicants for livestock sprays in the laboratory, but also conclusively proves their worth where it *really* counts—in the field, barn and stable!

For example, sprays containing Thanite underwent three years of exhaustive tests at the Kansas State College Farm, in competition with 16 other sprays. Thanite was found superior in killing power to any other oil-base toxicant. As little as three gallons in 97 gallons of base oil will produce a top-grade livestock spray. Tests such as these are continuing.

Both Thanite and Thanasol 70—a water-miscible form of Thanite, especially designed for livestock sprays—are even now being tested on herds to determine the optimum dosage for effectiveness and economy. In addition, a Hercules entomologist is now working in dairy barns with a state agricultural experiment station to obtain more field data on Hercules residual-type toxicants.

For complete details on *all* Hercules toxicants, send for the book, "The Thanite Family."

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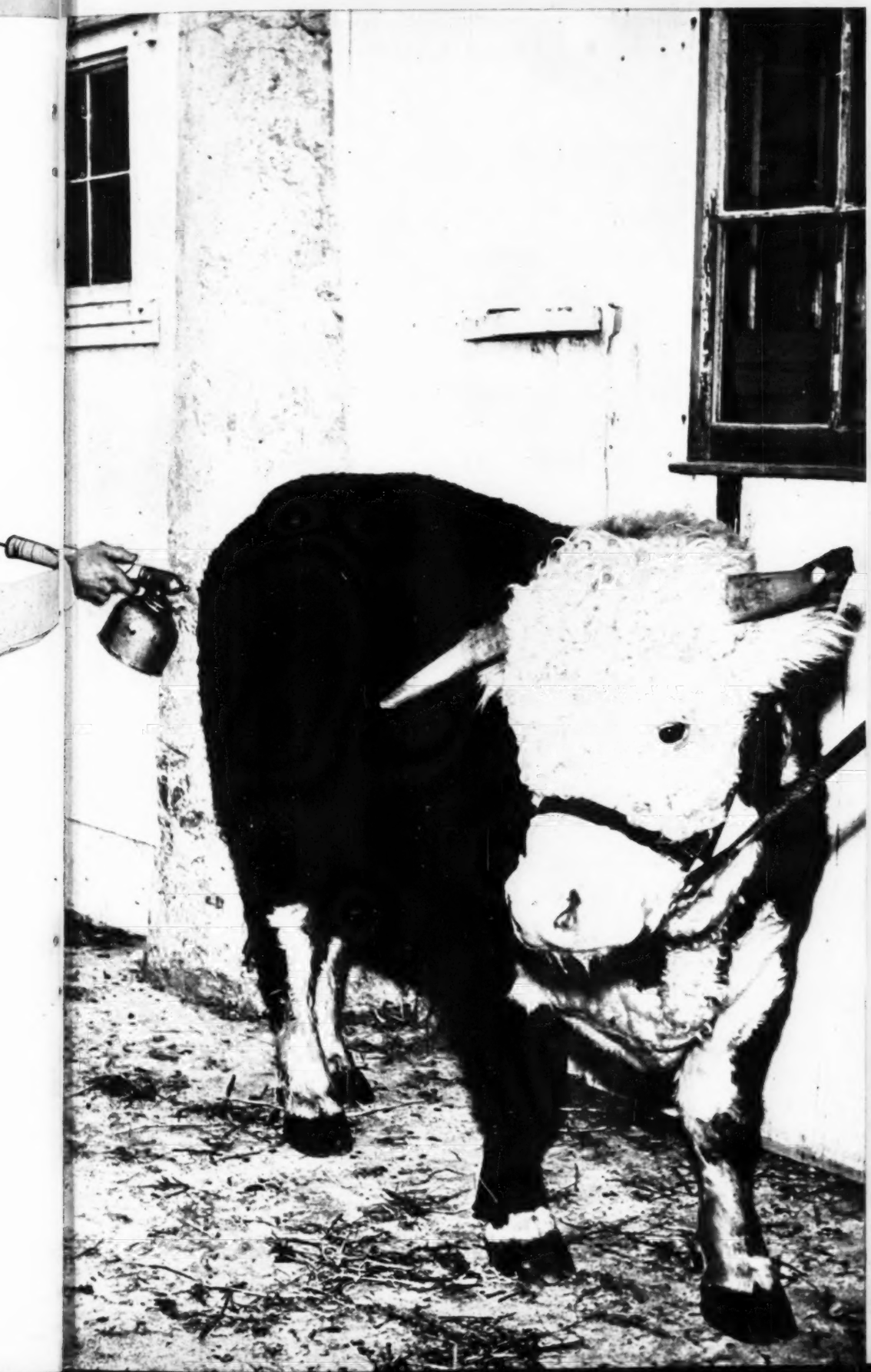

Hercules' new family of toxicants

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THANITE*

Makes a fast-knockdown, high-kill spray effective against household pests such as flies, mosquitoes, bedbugs, silverfish, ants and moths.

THANITE + DDT CONCENTRATE

The addition of DDT to Thanite utilizes the best features of each toxicant. Makes a 100% "Knockdown," 100% "Kill" spray at a very low cost. Such sprays are highly effective—even against cockroaches.

THANASOL 70

A water-base toxicant especially recommended for use in kennels and on livestock. Thorough tests have demonstrated its effectiveness and long-lasting repellency, in both sprays and dips.

THANASOL 70 + DDT CONCENTRATE

Water-dispersible—combines residual effect against horn flies with speedy knockdown and high kill of stable flies. Ideal for making fully-effective livestock sprays.

AEROSOL DDT

Made only by Hercules and designed specifically for use in Aerosol bombs. Now available in quantity.

WATER-MISCIBLE DDT CONCENTRATE (25%)

Water-dispersible—for use in spraying barns, city dumps, garbage pails, industrial buildings, where the residual effect of DDT is required in the most economical form.

OIL-SOLUBLE DDT CONCENTRATE (25%)

A general-purpose concentrate for use wherever DDT in oil solution is required—such as in storage closets, around baseboards, kitchen sinks, and lamp cords.

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Legislation . . .

TODAY there are more than 300 Federal and State laws, regulations and interpretations affecting agricultural insecticides, fungicides and other chemicals.

One of this Association's services to its industry is a continuing report on all of these as they develop.

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Raw Material Markets . .

INTERESTING developments in the market picture have taken place since last month's report, with the present over-all supply outlook appearing to be slightly improved, at least in some respects. Arrival early in July of 710 tons of rotenone and of an additional 342 tons in the middle of the month gave some relief to a previously acute situation. Distribution of the newly-arrived material was made on the basis of grinding capacity of millers, and the speed with which they could get the finished product into the hands of farmers for fall crops, and late summer crops in the north and east. The July shipments are harbingers of more imports of rotenone, it appears, and from mid-August the imports should fairly well keep pace with needs. Additional shipments of 500 tons are expected by September 1, and before October 1 some 1,200 tons more are expected. The balance of export needs for the current crop season have already been taken care of by the two arrivals of July.

While the rotenone picture brightens, other portions of the insecticide market are not so optimistic. Although production of calcium arsenate in April was twice that of the previous month and 100 per cent over the figure for April, 1945, the situation appears to be tightening now due to a shortage of arsenic and because of a depletion of dealers' reserve stock which are at a dangerously low level for this time of year.

That the pyrethrum supply situation is favorable once again, is evidenced by the fact that this insecticide (in powder, flower, and extract form) has been removed from the positive list and can now be exported under general license. April imports, principally from British East Africa, totaled 2,689,000 pounds, making the total supply of pyrethrum plentiful, although the imported tonnage for April totaled only about half of the amount received in March. Exports of pyrethrum amounted to only 7,825 pounds in April compared with 22,272 pounds in March.

DDT output is on the increase month by month, with the April production reaching an all-time high of 4,140,000 pounds. This figure represents an increase of 22 per cent over the production of March, and 54 per cent over the output of April, 1945.

Copper sulfate supplies are below normal, and indications are that they will continue to be for some time despite the fact that the volume of supplies is on the increase. Favorable to the domestic market is the relatively low export tonnage during April, 4,615,000 pounds, which was less than for any other month in 1946. Even so, this figure represents almost twice the amount of copper sulfate that was shipped in the corresponding month of 1945. Most of the tonnage was destined for Bulgaria which received 4,400,000 pounds of the April exports. (Bulgaria had need of the fungicide for protection of its grape crop).

Nicotine and nicotine sulfate present a pessimistic note, continuing in short supply. Contrasted to exports of 33,600 pounds in March, exports amounted to only 14,000 pounds in April, of which 10,000 pounds were destined for Canada. Noteworthy in this connection is the news that a Cuban tobacco firm is investigating the possibility of extracting nicotine sulfate from Cuban-grown tobacco. Installation of a plant in Habana is being considered, according to reports by the U. S. Department of Commerce, and such a project could encourage production of high-nicotine varieties of tobacco.

Fertilizers

A SEASON of extra-heavy consumption of fertilizer has just passed, leaving the stock carry-over at a very low level. Figures for the 1945-46 season are of course not yet available, but heavy sales made during the past spring provide strong evidence that use of fertilizer during this fiscal year has exceeded that of the previous season. This is significant in itself, inasmuch as last year's fertilizer consumption is computed by the National Fertilizer Association to have been 13,201,703 tons, which was a 7 per cent increase over the year before. Estimated production of fertilizer during the 1945-46 year was 13,860,000 tons.

Nitrogen production is expected to surpass previous records with the added impetus of the War Department's plan to put all idle Government-owned synthetic ammonia plants into operation, along with the necessary nitric acid productive and ammonium nitrate graining facilities. Plants not sold or leased to private industry will be operated by the War Department, according to the plan. Nitrogenous fertilizers turned out under this program will be used largely for export, but it is thought that the domestic supply should be bolstered to a certain extent by this means.

However, at the present time, stocks are generally low following a small output of ammonium sulfate in April (47,222 tons). This figure was 23 per cent less than March, and 26 percent under the production of April, 1945. Effects of the coal shortage of earlier in the spring were still being felt, although production was recovering somewhat in June.

A similar situation exists in other fields of nitrogenous fertilizers so far as April was concerned. Synthetic ammonium sulfate output was down from the preceeding month; Imports of Chilean nitrate were under the figures of a year ago to such an extent that it was considered doubtful that subsequent shipments will be at a rate sufficient to attain the year's goal of 700,000 tons. (United States exports of nitrogenous materials totaled a little over 15,000 tons in April, greater than March shipments. France, Italy and the Netherlands were the chief destinations.)

(*Continued on Page 62*)

TECHNICAL Briefs

Recent Technical Developments in the Agricultural Chemical Field

Parasites to Fight Borer

Nearly a million parasites of the European corn borer have been released in ten New York counties through the co-operative efforts of the State Experiment station, the United States Department of Agriculture Bureau of Entomology and Plant Quarantine, and the New York State Department of Agriculture and Markets.

According to Dr. L. A. Carruth of the State Experiment station at Geneva, N. Y., the outlook for success against heavy infestations of the corn borer is promising. He points out that an extensive search in Europe and the Orient by entomologists of the U. S. Department of Agriculture has produced a number of parasites of the corn borer and the more promising of these have been brought to the United States for propagation and liberation.

Up to the first of the year, nearly 7,000,000 parasites of all kinds had been released in 14 states since the beginning of the project by the federal Department of Agriculture.

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War Chemicals in Use

New developments in chemicals for control of various agricultural pests are described by E. D. Witman in *Chemical Industries*, 58, 590-2. A compound called "DDD," similar to DDT chemically, has recently been put on the market. It is 1, 1-dichloro-2, 2-bis-(para-chlorophenyl)ethane, and has the trade name of "Rothane." Hexachlorocyclohexane, also called "666," may find use as a general aphicide. It is complementary to, rather than a substitute for DDT.

Among the newer fungicides, iron and zinc dithiocarbamates are finding increasing use for the control of various plant diseases. Tetrachlorobenzoquinone is useful as a seed fungicide. Heptadecyl glyoxalidine, also known as compound 341, has been studied as a crop fungicide and has shown good control of apple, cherry, and rose diseases. It is not wet by water.

Two new rodenticides came out of wartime research: sodium fluoroacetate, known as 1080, and alpha-napthyl thiourea, known as A. N. T. U. The latter is a contact poison for rodents.

In regard to use of hexachlorocylohexane as an insecticide, more than 300 pounds of the material were recently shipped by U. N. R. R. A. to Sardinia where a serious grasshopper invasion threatened crops. Reports indicate that not only were millions of the insects poisoned outright by the material, but that additional numbers died as long as four days after eating the carcasses of previously-poisoned grasshoppers. Application methods included spraying from trains, it is reported. Observers tell of millions of dead grasshoppers being shoveled off roads into ditches following application of hexachlorocyclohexane. The material was donated to UNRRA by E. I. duPont de Nemours and Company, Wilmington, Del.

•

Fire Ant Control

M. R. Osburn and N. Stahler of the Bureau of Entomology and Plant Quarantine, U. S. D. A., in bulletin E-683 (1946) describe efforts made to control the fire ant. Sprays containing oil, pyrethrum, derris, or dinitro-ortho-cyclohexyl phenol will destroy many small ones, but heavy reinfestation occurs in a week or two following treatment. DDT is much more toxic and provides a more permanent control. An emulsion containing 0.25-1.0 pounds of technical DDT, 1 gallon of No. 2 fuel oil, 1.3 fluid ounce of glyceryl oleate and sufficient water to make up to 100 gallons is recommended for spray applications. Particular attention should be given to covering the trunk and larger lower limbs of the tree, it is pointed out.

•

Low DDT Dosages Effective

Applications of 1/8 to 1/4 pound of DDT per acre proved effective in controlling forest insects in recent aerial spraying, without apparent serious permanent injury to beneficial insects and other animal life, according to a bulletin by the U. S. Bureau of Entomology and Plant Quarantine, E-684, 14 pp. (1946). This story of controlling forest insects with such low dosages of DDT is described by F. C. Craighead and R. C. Brown.

•

Rodent Destruction Heavy

Rodents, insects and fungus molds destroy 10 per cent of the world's annual production of cereals, beans and oil seeds, according to a report by a group of scientists to the United Nations Food and Agriculture Organization. This year's loss of 72.5 million tons, it was estimated, is more than seven times the ten million tons of wheat the world will be short in 1946.

•

Oats Disease in Iowa

Growers of oats in Iowa are faced this year with a serious plant disease known as a "Helmenthasporium Blight" which causes a seedling and a leaf blight, and spreads to the grain where the disease is carried to the seedling the following spring.

According to Donald M. Coe, extension plant pathologist at Iowa State College, Ames, the disease first appeared last year and has developed into serious proportions this season.

Evidence of the disease is seen when the leaves dry up, turn brown, and when growth of the plant is stunted. Outwardly the oats appear fired. Seed laboratory records of the past winter showed the disease was present on many samples, and field surveys made during the past spring showed infections as high as 75 per cent. Since the blight affects seedlings, a serious situation threatens next year's crop.

Mr. Coe reports that the fungicide being used to combat the disease is "Ceresan", an organic mercury product marketed by Bayer-Semesan Division of E. I. duPont de Nemours & Co. The state of Iowa ranks second in Oats production in the United States, being surpassed only by Minnesota. Iowa's oats crop in 1944 was 144,270,000 bushels, and Minnesota's crop reached nearly 156 million bushels.

•

Orchard Site Selection

New York State College of Agriculture at Cornell U., Ithaca, N. Y., has recently published a booklet, Extension Bulletin 697, "Orchard Site Selection.' Author is Damon Boynton. The bulletin discusses the factor of climate and soil in selecting an orchard site, and presents charts and diagrams to illustrate the text.

•

Britons Spray In Big Way

British scientists attending the recent Royal Society Empire Conference in Cambridge saw a model of the Spraying Mantis, the world's largest helicopter which when completed will be able to carry four tons of insecticide to be distributed from a 100-foot-long boom fitted with sprays. The machine has two rotors mounted on the spread eagle forearms, giving a spread of nearly sixty feet.

Demonstrations with smaller helicopters showed the scientists how the spray is able to reach all parts of the leaves to get to the tsetse fly which is on the underside of the leaf. The slipstream of the aircraft's rotors was reported to be part of the spraying process. The Spraying Mantis is being built by the Cierva autogiro firm to the specifications of Pest Control, Ltd.

Elm Disease Threatens

Dutch elm disease, threatening the lives of some 7,500 elm trees on private grounds in Montclair, N. J. was causing a considerable amount of worry to townspeople and city officials this summer. Although various steps were taken with insecticides to halt the beetles which are thought to carry the disease, Raymond D. Shepard, director of parks and public property urged private owners to "have diseased elms cut down and burned" for the protection of their own and others' healthy elms. Early reports indicated that the community would be obliged to spend nearly $400,000 to check the disease, but Mr. Shepard said that he did not anticipate such an expenditure.

•

U. of Missouri Booklet

Station circular No. 308, "Insect Control With DDT," is announced by the College of Agriculture, University of Missouri, Columbia. Authors are L. D. Haseman, George D. Jones and C. W. Wingo. The writers credit DDT as being a valuable addition to the chemical materials used in fighting insects. "No other insecticide is so effective for so many different kinds of insect pests", they say, but also state that there are many insects on which DDT has practically no effect. Included in the circular are the five forms in which DDT appears on the market, and the insects on which the various forms are most effective. Detailed suggestions are also given on how to control insect pests of livestock and poultry, and garden and fruit insects.

•

Scientists in Germany

Of four chemical experts from the United States visiting Germany to study scientific developments there, one has been sent to investigate German insecticides, organic chemical products and adhesives. He is Dr. Jack T. Thurston, director of chemical research at the Stamford Research Laboratories, American Cyanamid Co., Stamford, Conn.

The other three scientists visiting Germany on other missions of chemical investigations include Dr. Herbert S. Coith of Proctor & Gamble Co., Dr. Victor L. King of the Calco division of American Cyanamid Co., and A. Stanley Fromholz of the Stamford division of American Cyanamid Co.

Arrangements for the project were made through the Chemical unit of the Technical Industrial Intelligence Division, Office of Technical Services, of the Department of Commerce. Reports of their findings will make available to the public through O.T.S. later.

•

Peach Borer Described

Detection of the peach borer, one of the most destructive of insects on this type of plant, is described in the July-August *Agricultural News Letter* published by E. I. du Pont de Nemours & Co. Masses of gum mixed with saw-dust-like refuse at or near the bases of the trees reveal the presence of peach borer infestations, the article says. The injury itself may extend above the ground line for 10 or 12 inches and below the ground line along the main roots for as much as 8 inches.

Adult moths deposit large numbers of eggs on the trunks of the trees or on trash or in crevices in the ground near the trees. The young borers that hatch from these eggs tunnel through the bark into the growing tissues of the trees, causing serious damage to the tissues.

The usual method of control is through use of paradichlorobenzene, the article indicates. Many peach trees, killed each year, might be saved through this means. Paradichlorobenzene gives best control of such infestations if applied in the fall of the year when the soil is neither too warm nor too cool. If temperature is too high, the material volatilizes too rapidly and may injure the tree. If temperature is too low, vaporization is slowed, and the amount of gas formed is too small to be effective. Below 60 degrees, (F), the chemical loses effectiveness. Trees of all ages, from nursery stock to those ten or more years of age, are victims of borer attack. Many young trees, sometimes attacked within a year after planting, are girdled and killed. Older trees are often injured so severely

that their vitality is reduced markedly. This, in turn, prevents production of a satisfactory crop, and renders the trees more susceptible to the attacks of other insects such as pinhole borers and fruit-tree bark beetles.

Peach borer, in addition to its depredations on peach trees, occasionally becomes a serious pest to plum and cherry trees. The caterpillar is a yellowish-white or cream color with a dark-brown head, and when full grown is about 1½ inches long.

•

New Blight in Oats

Experiments at the Iowa Agricultural Station, Ames, have disclosed an extreme susceptibility of the Vicland variety of oats to a new blight and root-rot disease caused by a fungus, (*Helminthosporium.*) According to data gathered at the Iowa station, this new disease attacks all varieties of oats with Victoria parentage. The significance of this fact is pointed out as being "appalling," since it strongly indicates that resistance to crown rust is linked with susceptibility to the Helminthosporium disease. In this way, desirable new varieties of oats such as Boone, Cedar, Fultex, Letoria and Neosho, while being free from rust, are extremely susceptible to *Helminthosporium.*

W. F. Crosier, writing in the July, 1946 edition of *Farm Research*, quarterly bulletin of the New York State Agricultural Experiment Station at Geneva, reports that the disease is widespread and probably extends to all areas growing Vicland oats. Seed stocks of this variety grown in many states and tested at Geneva have without exception carried the Helminthosporium fungus, he reports. However, the disease does not attack older varieties of oats, as indicated by a lack of root-rot or blight in either Cornellian, Ithacan, or Lenroc oats planted among the Vicland test rows. Rows of the latter growing in the greenhouse have averaged 18 per cent dead and 32 per cent blighted plants even when adjoining rows of entirely healthy Lenroc.

Preventive measures, according to Mr. Crosier, controls seed-borne infections "partially to entirely" through use of "Ceresan" dust. A new material, however is reported to have given better control. It is ethyl mercury para toluene sulfonanalide, otherwise known as "duPont 1452F."

The disease itself may appear as dark yellow to reddish brown stripes extending one half to the entire length of the first leaf or it may occur as a severe root-rot resulting in a marked stunting or even death in the plants. In the latter case, the normal green leaf color gradually fades along the margin of the leaf to the base. In cases of severe root-rot the leaves turn yellow to dull brown, become pendulant instead of upright, and the entire plant dies through loss of roots or through rotting of the coleoptile just below the soil.

•

Dust, Spray Cabbage Pests

New York State Experiment Station at Geneva, N. Y. has found control of cabbage worms and aphids possible through use of either dusts or sprays. Lead arsenate or rotenone holds the worms in check, while nicotine dust is applied for aphids. Such control resulted in a much heavier yield.

Micro Nu-Cop

A fixed neutral insoluble micronized* tribasic copper sulphate containing 53% metallic copper for dusting or spraying. No lime required—extremely fine particle size, 2-5 microns.

*Trade Mark registered U. S. Patent Office by Micronizer Processing Company, Moorestown, N. J.

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Chemicals for Agriculture

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British Weed Killers

In a discussion about chemical weed killers in England, W. E. Ripper, Managing Director, Pest Control, Ltd., reports the progress made in Great Britian with various forms and combinations of weed killers. The article, under the title of "Tendencies of British Farming Favour Use of Chemical Weed Killers" appeared in the June, 1946 edition of *Manufacturing Chemist and Manufacturing Perfumer*.

The author points out that the past decade has seen Great Britian take the lead in chemical weed-killing technique. He attributes this to the steady decline in the supply of farm labor, the increase in the cost of labor which made former methods of weed control by hand uneconomical, and the stimulus of wartime food shortages.

History of the development of chemical weed killers is told, relating how in the early stages of chemical weed control the selectivity of weed-killers was less, and the risk greater. Sulphuric acid, for instance, is reported having been used with some success on charlock, but at the same time threatening or actually scorching corn planted in the same field. Cyanamide was used later, and while it gave good control of weeds, the supply was cut off during the war years, and it thus became necessary to turn to coal-tar products.

The inflammability of sodium dinitro-ortho-cresol caused a number of accidents in application, so experiments turned to dinitro-ortho-cresol (D.N.C.), the free acid which is non-inflammable and which showed an improvement in weed-killing properties over its sodium salt. The article continues with a description of the selective action of this weed killer, and factors affecting its use.

Long research on dinitro-ortho-cresol revealed the fact that the material accelerates metabolism in a plant, so that the organism to which it is applied uses up nutrients and oxygen more quickly than it is possible to replace them. Experiments continue through use of chlorinated phenoxy-acetic acids, which, in small doses act as growth-stimulating hormones. A significant parallel is noted here to the development of 2,4-dichlorophenoxy-acetic acid in the United States.

•

Gypsy Moth Control

Control of Gypsy Moth in Pennsylvania forests is being accomplished through use of DDT spread by airplanes, says Dr. F. C. Craighead, Head of the Forest Insect Investigation department of the United States Department of Agriculture. He states that some 30,000 acres of forest land are being sprayed at the rate of one pound of DDT per acre. Satisfactory control has been assured by results of two previous years of investigation, he points out. "This work points the way to eliminating the destructive effects of the gypsy moth which annually defoliates nearly 23,000,000 acres of forest in this country," he says.

In commenting on DDT, Dr. Craighead says that the insecticide is also making possible the widespread control of other forest insects such as the spruce bud worm, the hemlock looper, pine tip moths, spittle bugs, pine sawflies and white pine weevil.

Fungicides Discussed

Comparing the quiet, malignant attack of fungi upon seeds, plants, fabrics, and food to the corrosion of a metal and its subsequent mechanical weakening, *Industrial and Engineering Chemistry* in its July, 1946 issue carries a treatise on "Fungicides."

It explains the workings of fungi on host materials, describing how by sucking nutrition from a plant, destruction is brought about, and how this action results in a breakdown of the chemical and mechanical structure of the material. As to the role of the fungicide, it is explained that because of its molecular shape, it is probably able to block off the addition of food material to the fungus, and thereby keep the latter under control.

Fungicides are classified as metallic-inorganic, metallic organic, and organic in the article, and various uses of each are cited. It points out that in general, mercury derivatives of an organic nature are found less harmful to seeds and plants than the straight organic mercuric compounds. Ethyl mercury phosphate and chloride are commended for service as agricultural fungicides.

Radio-Active Beetles Reveal Course

BRITISH scientists of the Rothamsted Experiment Station are reported to have made some interesting observations in determining the speed and extent of travels by chick beetles, one of the major agricultural pests of the British Isles.

Three of the beetles were fitted with tiny aluminum containers holding five-millionths of a gram of radium each. The radium enables investigators equipped with a 1,000-volt beetle detectors which operate like mine detectors, to mark exactly the course of the beetles' wanderings over any given period of time. Although no person sees the insects burrowing through the ground, the detector tells the exact spot and enables observes to mark the distance traveled since the previous day.

The detector is the invention of G. A. R. Tomes of West Wickham, Kent. It is composed of a delicate glass tube containing a sensitive rod, which is electrified from an ordinary electric point. When passed over the spot where the radio-active beetles are believed to lie, a signal box gives out high-ringing notes to indicate proximity. Then at the point where the signals are strongest, an identification peg is placed in the ground and the progress of the past 24 hours is noted. Scope of travel is governed by age and fitness, the report indicates. One beetle one day traveled 9 feet; another 5 feet, and the third only 6 inches.

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3. BLACK LEAF POWDER AND PELLETS — for controlling the large round worm in chickens.

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INDUSTRY NEWS

Fertilizer Prospects Good

The fertilizer supply outlook for 1946 and 1947 appears good for all three of the major nutrients, with the prospects for superphosphate the brightest; potash and nitrogen following in that order. This is the opinion of the National Fertilizer Association presented by Maurice H. Lockwood, president, at a press luncheon July 16 in Washington.

According to Mr. Lockwood's estimates, the supply of nitrogen is likely to be up about 2 per cent over 1945-46, potash about 5 per cent, and superphosphate will be produced in quantities approximately 14 per cent greater than those of the past year. These figures were based upon schedules uninterrupted by strikes or transportation failures, it was pointed out.

Regarding potash, which is under government allocation, Mr. Lockwood said it was the understanding of the group that this material would be allocated on an approximate basis of 100 per cent of the June-March 1944-45 deliveries to most units of the fertilizer industry, with the small prospective overall supply increase to be used for allocations to new plants and certain areas as recommended by the U. S. Department of Agriculture.

•

New Corporate Setup

Zehrung Chemical Company is the new corporate name of the firm formerly known as Miller & Zehrung Chemical Co., of Portland, Oregon. According to C. V. Zehrung, president, there have been no changes in ownership, management, or policies in the company. The name was shortened to eliminate possible confusion with other suppliers.

In addition to president Zehrung, other officers include F. D. Carroll, sales manager of the agricultural chemical department and Richard Bailey, chemical engineer in charge of all manufacturing operations. The company produces agricultural and household insecticides, fungicides, rodenticides and weed killers. Sales at present are principally confined to the Pacific coast region.

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Harnden to Chapman Co.

Robert C. Harnden has been named head of the recently formed agricultural chemical division of the Chapman Chemical Company, Chicago. The division's agricultural line will consist of 2,4-D weed killer, soil fumigants and insecticides. Mr. Harnden was formerly manager of the Dowicide division of the Dow Chemical Company, Midland, Michigan.

•

Ag. Development Committee

Study of insecticides, fungicides, weed destroyers, fruit ripeners, liquid fertilizers and kindred products has been listed on the agenda of the American Petroleum Institute's newly created Agricultural Development Committee. W. R. Boyd, Jr., president of the Institute, made known in announcing the new project to farm organizations recently.

The Committee was formed, Mr. Boyd explained, to provide a means of liaison between the oil industry and agriculture, which is a tremendous consumer of petroleum products. Members of the committee will include technical men from the large oil companies who will work with government agencies and farm organizations. All findings from the studies will be made public without charge.

Experts in farm problems will be consulted, Boyd said, and an extensive program formulated for developing use of petroleum products on the farm, as well as finding new uses for farm products in the petroleum industry. Encouragement will also be given, he said, to possibilities for combining petroleum chemicals with agricultural products to form new products and new industries.

Corn Borer in Illinois

Aided by a grant of $15,000 from Illinois commercial canners and an additional $5,000 from the Velsicol Corp., Chicago, the Illinois Natural History Survey, Urbana, Ill., has been conducting a special emergency research study of insecticides for control of the European corn borer in sweet corn fields. Insecticides were applied by airplane and by ground equipment under the Survey's supervision at two points, one in Northern Illinois and the other in the east central sweet corn section where heavy infestation has appeared.

Last year considerable quantities of sweet corn were destroyed and work of the canneries was made difficult and from appearances in advance of harvest, this year's situation may be even more serious, it is reported. Leo R. Tehon, acting chief of the State Natural History Survey, has general charge of the investigation for the canners.

•

H.R. 6777 Defeated

Government plans to construct a $3,000,000 phosphatic fertilizer plant at Mobile, Ala., came to a halt on July 15 at which time the senate, upon motion by Senator McKellar of Nebraska, receded from the amendment to H.R. 6777 which was to provide the funds for actual construction of the TVA fertilizer plant.

The congressional controversy over appropriation of funds of course ended when the senate's action was announced, but before that time long debates had been held with the foes of the proposal growing continually more numerous. The first house vote turned down the amendment by only 13 votes, whereas the second vote found the measure defeated by a majority of nearly 2 to 1.

The senate agreed to drop the matter after the house had demonstrated its overwhelming disfavor of the government's going any deeper into fertilizer production.

Potato Land Fumigation Under Way

FUMIGATION of 1,210 acres of Long Island potato land is being carried out in Nassau county this month under the joint supervision of the Agricultural Research Administration of the Bureau of Entomology and Plant Quarantine, U.S.D.A.; the Division of Nematology of the Bureau of Plant Industry, Soils and Agricultural Engineering; the New York State College of Agriculture at Ithaca and the New York State Department of Agriculture and Markets. The project is for the purpose of controlling a heavy infestation of golden nematode which for a number of years had caused losses throughout the area around Hicksville, L. I.

Rainy weather caused postponement of the starting date, originally set for July 22, but the work has continued on favorable days since that time. The operations were expected to continue for about a month.

Equipment includes farm tractors carrying tanks which hold quantities of dichloropropane-dichloropropene, soil fumigant distributed by Shell Chemical Corp. under the trade name, "DD." The liquid is delivered to the soil in carefully calibrated amounts through six nozzles directed downward behind as many shovel-type cultivator teeth spaced, a foot apart. They dig a furrow about 8 inches deep. This outfit covers 15 to 20 acres a day. Following treatment, the soil is rolled to pack the surface and retain the fumes.

The golden nematode was first discovered in England in 1903, and has continued to spread until today nearly 150,000 acres are affected in the Yorkshire area surrounding the place where the pest was at first noticed. Areas in Germany, Scotland, Ireland and the low countries of northern Europe have all experienced the golden nematode, and its spread in a 10 year period in Sweden after its discovery in 1922 aroused that government to prohibit the growth of potatoes in 1932 in any area known to be infested. In 1938 the disease was found in 91 communities, mostly in south and central Sweden, and by 1943, in 156 communities, an increase of 70 per cent in 5 years.

As has been previously reported, the golden nematode was first discovered in America around 1934 in Nassau county, Long Island, in the area now under fumigation quarantine. It was 1941, however, before a diagnosis by Dr. B. G. Chitwood of the Federal Division of Nematology named the trouble as being caused by the nematode. He said at the time that the pest had probably been present four or five years before the initial discovery.

Control of the nematode is made difficult by the fact that cysts containing from 100 to 600 eggs apiece may remain dormant for years, thus remaining unhurt by ordinary rotations and hatching out later to continue the destructive cycle.

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to 112,000 Sq. Ft.

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PROBLEMS facing the insecticide and fungicide industry including those of technical and legislative nature as well as matters of marketing will be discussed at the 13th annual meeting of the Agricultural Insecticide and Fungicide Association scheduled for September 3, 4 and 5. Place of the three-day convention will be the Essex and Sussex Hotel, Spring Lake, New Jersey.

Plans for the convention include the presence of outstanding personalities of the industry who will lead discussions on various phases of the field. Among those invited to appear are Clifton A. Woodrum, president of the American Plant Food Council; Ray L. Cuff, Southwestern Regional Director for the National Live Stock Loss Prevention Board, and George Krieger, chairman of the agricultural development committee of the American Petroleum Institute. That a number of other men prominent in the industry would be on the program appeared likely a month preceding the meeting, according to Lea S. Hitchner, Executive Secretary of the Association, but definite arrangements were dependent upon other factors at that time, he indicated.

The opening day of the convention, Tuesday, is reserved for meetings of the committees and of the Board of Directors of the Association. Open sessions will feature Wednesday's schedule, with reports being made by officers of the group. President G. F. Leonard of Tobacco By-Products Corporation, Louisville, Ky., will make his annual report, followed by Mr. Hitchner and by L. L. Hedgepeth of Pennsylvania Salt Mfg. Co., chairman of the legislative committee.

That afternoon a golf tournament is planned and in the evening a stag dinner with Willard H. Allen, New Jersey State Secretary of Agriculture, invited to be the guest speaker.

The schedule for Thursday, last day of the convention, is one of importance with various reports planned, and discussions of topics vital to the industry. Report of the membership chairman, Ernest Hart will be made, and Dr. L. Gordon Utter of Phelps-Dodge Corp., chairman of the information committee will make his annual report before the group. Speakers invited to take part in that day's activity include Allen B. Lemmon, chief of the bureau of Chemistry of California State Department of Agriculture; Representative John W. Flannagan (Democrat of Virginia), chairman of the House Agriculture Committee; Dr. F. C. Bishopp, assistant chief of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, and E. R. Eastman, editor of *American Agriculturalist* magazine.

Association officials indicate that a heavy registration is expected at the convention, particularly in view of a sharp increase in AIFA membership, and the fact that the site of the meeting is an attractive one with numerous facilities for recreation. Among the latter are included ocean bathing and golf. Post-

(*Continued on Page* 54)

13th Annual Meeting

AGRICULTURAL INSECTICIDE AND FUNGICIDE ASSOCIATION

The time:
SEPTEMBER 3, 4 and 5

The place:
ESSEX and SUSSEX HOTEL
Spring Lake, N. J.

And meet the speakers:

George Kreiger

Chairman of the newly-formed Agricultural Development Committee of the American Petroleum Institute. Mr. Krieger has been in charge of farm research for Ethyl Corporation since 1930, with the exception of more than two years with the War Production Board. He holds the first degree ever issued in professional agricultural engineering from Virginia Polytechnic Institute. He is a former chairman of the fuel and lubricants committee and the agricultural engineering research committee of the American Society of Agricultural Engineers, and was twice vice-president for tractor and farm machinery activities of the Society of Automotive Engineers. The program of his new committee holds great interest to agriculture and to the agricultural insecticide and fungicide industry.

Clifton A. Woodrum

President of the American Plant Food Council, Inc., Washington, D. C. He was drafted by the fertilizer industry after a notable record in Congress. A lawyer in Virginia State and Federal courts, for many years, a State's attorney and judge. Began his service in the House of Representatives in 1922 and rose to become ranking Democrat on the House Appropriations Committee and chairman of the Select Committee on Postwar Military Policy. Upon being selected for the Plant Food Council presidency last September, he re-

(*Continued on Page* 54)

AIF MEETING

(Continued from Page 53)

war problems of production, securing raw materials, and the effects of removal of price ceilings are also matters about which association members seek information at the convention. The AIF announces that the regular sessions are open to members of the agricultural press, and to federal and state people who are interested in attending.

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AIF SPEAKERS

(Continued from Page 53)

tired from the House to devote full time to the new organization.

•

Ray L. Cuff

As Southwestern regional manager of the National Live Stock Loss Prevention Board, Kansas City, Mo., Mr. Cuff is well known to many AIF Association members who will attend the meeting. The N.L.S.L.P. Board is sponsored by and represents on its directorate, the American Meat Institute, Tanners' Council of America, American Humane Association, United States Department of Agriculture, producer associations, western railroads, livestock insurance companies, stockyard companies and livestock exchanges.

•

John W. Flannagan, Jr.

Mr. Flannagan is chairman of the House Committee on Agriculture. He practices law in his home state of Virginia, and in 1916 was elected Commonwealth's attorney for Buchanan County. In 1930 he was elected to Congress where has since made a record for administration of the Agricultural Committee. In addition, he is also a member of the select committee on Conservation of Wildlife Resources. Both through his official position and his interest in the problem, he has been a sponsor of the proposed new Federal Insecticide Act, known by his name.

•

Willard H. Allen

Mr. Allen is New Jersey State Secretary of Agriculture, holds a position almost unique among public office inasmuch as selection is made by the State Board of Agriculure (representing farm organizations) rather than through election or appointment of political nature. Mr. Allen was born in Connecticut, was graduated from Agricultural College there in 1916, served in the first World War, later in the Connecticut Experiment Station, and came to New Jersey in 1921 as an extension specialist in poultry husbandry. Since that time he has been a county agent leader, State AAA head, and since 1938, Secretary of Agriculture. He makes his home in Princeton, and is a partner in one of New Jersey's outstanding poultry farms.

•

Dr. F. C. Bishopp

As one of the assistant chiefs of the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture with offices in Washington, D. C., Mr. Bishopp needs no introduction to members of the Agricultural Insecticide and Fungicide Association. Entomologists in many parts of the world know him as one of the leading authorities in the field. His remarks at the Association meeting will bear weight

•

Allen B. Lemmon

A native Californian, ranch-raised; a civil engineering graduate of Leland Stanford University, and since 1933 has been in the service of the California Department of Agriculture. Starting as an inspector of economic poisons and fertilizers, he worked up to become acting chief of the Bureau of Chemistry when Dr. Alvin J. Cox retired a year ago. Passing first in nation-wide competition in a Civil Service examination, he was appointed as the new chief last January.

REVOLUTIONARY!

TWO matters of revolutionary nature are seen in the accompanying photograph. Being sprayed by the new Accurate Universal Insect Control Unit is the historic Hackleton elm at Milburn, N. J., behind which George Washington sought shelter in the Revolutionary war. A number of cannon balls and other pieces of shot have been removed from the tree's trunk and branches.

Now it is being threatened by Dutch Elm Disease and attacked by Elm leaf beetles . . . enemies more dangerous to it than were the British cannon 170 years ago. And as the Continental Army fought off the enemy then, a revolutionary new weapon is carrying the fight to insect invaders now. DDT is the ammunition, the powerful Accurate Unit the driving force.

ACCURATE UNIVERSAL INSECT CONTROL UNIT

Sprays insecticides in any direction via airplane engine and four-blade propeller (volume and direction by remote control of operator).
Flexible mounting enables unit to work in low bushes, high trees, gullies, hillsides, open fields, low lands, etc.
Insecticide tank holds 550 gallons.

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Chemical Seed Protection

Naugatuck Chemical Division of United States Rubber Company has announced development of a chemical for protecting corn and leguminous seeds in storage from decay and damage from weevils, grain moths and other insects. The product, for which no trade name was given, is a combination of "Spergon" and DDT. Its makers say that maximum protection can be given stored seeds through a period of from eight to ten months.

Experiments have indicated that the product is effective for hybrid seed corn, and in treating such seeds as peas, lima beans, alfalfa, clover and lespedeza. The company states that extensive field testing in various parts of the United States has shown that the product kills 95 to 100 per cent of the weevils in test batches of seeds within 48 hours.

•

New Corporation Name

"Lenny's Foods, Inc." is the new name of a Duluth, Minnesota firm which since the war has undergone reorganization which included changing of names and absorbing another firm. During the war, under the name of Midwest Dehydrating Co., it processed potatoes for overseas shipments. With the war's end, the business was purchased by a Minnesota corporation, and operated for a time under the name of Midwest Food Processors. Later the name was changed to its present designation. The firm will grow and pack food items specializing in Oriental foods and mushroom products.

•

Mission to Philippines

For the purpose of advising Philippine authorities on a national agricultural program, United States members of the Philippine-U. S. Agricultural Mission are in the Islands for a period to extend more than five months. The project is a joint mission with American and Filipino technicians collaborating in determining the best ways in which American and Philippine agriculture may be meshed. The considerations include matters of personnel, facilities and organization required to carry out the collaboration.

The mission will advise immediate actions which might be taken on emergency problems, in order to restore the war-damaged agricultural economy of the Islands. This is regarded as a particularly acute problem in view of the food needs, and necessity to restore production for purposes of trade.

Head of the mission is Leland E. Call, Dean of Agriculture and Director of the Agricultural Experiment Station, Manhattan, Kansas. Other members include authorities in agricultural extension work, agricultural economics and rural sociology. The mission is sent through the authorization of the State Department. Agricultural personnel was selected and the working program arranged by the Technical Collaboration Branch of the Office of Foreign Agricultural Relations, U.S.D.A., in collaboration with the State Department and the host governments—in this case the office of the High Commissioner and the Government of the Commonwealth of the Philippines.

•

DDT For Export

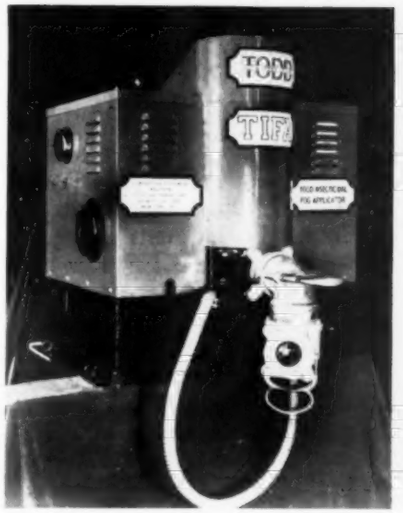
Announcement of the formation of a new DDT export division has been made by the National Agricultural and Metallic Pulverizing Company of Elkton, Md., and New York City. The new arrangement was made to facilitate shipment of the company's insecticidal products to Central and South America as well as to farming sections of the United States. Dr. Richard Heubner has been appointed director of research into new concentrations and combinations of DDT mixtures, in which the company specializes.

•

Food Council Moves

Offices of the American Plant Food Council, Inc. are now located in the Barr Building, 910 Seventeenth St., N. W., Washington, D. C. The Association had for a number of years occupied space in another building, but with increased activities and an expanded personnel larger quarters were needed. The Council recently added the services of a director of information and agronomist to make its services more complete.

Fog Machine Available



Todd Shipyards Corporation, New York, announces the availability of its insecticidal fogger for commercial use. The machine, developed as a post-war product by the company, is said to be capable of dispersing any insecticide, fungicide or weed killer that can be dissolved, suspended or emulsified in oil, water etc. Size of the particle distributed is fully controlled by the operator through the full range of "smoke" to spray. Powered by a small gasoline engine, the Todd Insecticide Fog Applicator (called "TIFA") is operated by one man.

•

Penn Salt Co. 2, 4-D

Pennsylvania Salt Company, Philadelphia, announces production of "Penco 2, 4-D," weed killer. The product is to be sold in powder form in 24 ounce cans, or in 50 pound drums. The powder contains about 70 per cent 2, 4-Dichlorophenoxyacetic acid, according to the announcement, and is intended for use chiefly in grain fields, pastures, lawns, golf courses, etc.

•

Southern Phosphate Sells

Davison Chemical Corporation, Baltimore, Md., has acquired the Florida phosphate properties of the Southern Phosphate Corporation. Date of transfer of the properties was set for August 1. The sale which involved $3,600,000 was approved by stockholders of the Southern Phosphate Corp. at a special meeting in New York earlier in the summer.

SEED TREATMENTS

(*Continued from Page 25*)

"Vasco" 4 (1 per cent and 3 per cent).

Moistening seed with 5 per cent "Methocel" sticker and treating with "Arasan," "Fermate," or "Thiosan" (each at 100 per cent and 75 per cent by weight) in 2 tests gave good control of smut in both cases and gave some indication that the 100 per cent dosage was slightly better than the 75 per cent dosage.

Peas: Fifty-three tests were made conducted in 22 States and one Canadian Province with Thomas Laxton seed treated with red copper oxide (2¼ oz. per bu.). "Arasan" (1½ and 2 oz.), and "Spergon" (1½ and 2 oz.). All materials proved beneficial to emergence of peas. "Spergon" gave the best results. The 2 oz. per bushel dosage appeared to be no more effective than "Spergon" at 1½ oz.

Spinach: Summary of results from 36 tests conducted in 25 States and one Canadian Province with seeds treated with "Arasan" (.25 per cent and .50 per cent by weight), "Fermate" (.5 per cent and .75 per cent), and zinc oxide (1.5 per cent and 2.0 per cent), again supports previous conclusion that seed treatment of spinach is a worthwhile practice. "Arasan," "Fermate," and zinc oxide at the dosages used gave significant increases in stands compared with untreated seed. Of the three materials used, zinc oxide consistently was better than "Arasan" and "Fermate." The results suggested that zinc oxide may be used successfully at a dosage of 1.5 per cent rather than 2.0 per cent as recommended in previous years.

Sweet Corn: Thirty tests conducted on the variety loana in 19 States and 1 Canadian Province using "Arasan," "Spergon," "Semesan Jr.," and "Barbak C" at 2 dosages (1.5 and 3.0 oz. per bu.) showed that seed treated with each of the protectants and at each dosage produced a significantly greater number of seedlings than untreated seed. The best results were obtained with "Arasan," followed in order of decreased efficiency by "Spergon," "Semesan Jr.," and "Barbak C." In each case the higher dosage was better than the lower. The percentage of seedlings classified as "weak" was reduced by all treatments, and again "Arasan" gave the best results, followed in order of decreased efficiency by "Spergon," "Semesan Jr.," and "Barbak C." Thus seed protectants may benefit not only by increasing total emergence but also by reducing the percentage of weaklings in the final stand.

Tomatoes: Data were received from 12 tests conducted in 10 States with seeds treated with "Spergon" (.3 per cent by weight of seed), "Arasan" (.3 per cent), "Semesan" (.3 per cent), "Yellow Cuprocide" (1.5 per cent), "New Improved Ceresan" (.5 per cent), and a 5-minute dip in a 1-1200 solution of "New Improved Ceresan." Improved stands were obtained in only 42 per cent of the tests. Where treatments were beneficial "Arasan" showed a definite superiority over the other materials, but "Semesan," "Yellow Cuprocide," and "New Improved Ceresan" also gave good results. "Spergon," as in 1943, seemed definitely less effective than the other materials for treating tomato seeds. The "New Improved Ceresan" was equally good whether used in dust form or as a dip.★★

A Standard Carrier for Insecticidal and Fungicidal Dust

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TALC

This grade of talc has proper and efficient bulking characteristics.

SOFT flaky particles which enhance stickiness.

COMPATIBILITY with all insecticides.

SOFTNESS which eliminates abrasion in dusting machine nozzles.

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Eastern Magnesia Talc Co., Inc.

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VERMONT

GRASSHOPPER CONTROL

(*Continued from Page* 18)

grasshoppers come in contact with bait particles by chance when they are crawling around on the surface of the ground. Since grasshoppers seek optimum temperature conditions it is possible that many of them in a field of succulent crop might remain on the plants and not come in contact with a poisonous particle while the particle remains effective.

Bait Materials Scarce

PROBLEMS of supply of bait materials have been perplexing. Sawdust supplies were heavily drawn upon during the years 1938 and 1939 and seasoned sawdust would soon have been exhausted had bait continued to be used at the same rate in succeeding years. With the recession in the grasshopper population and the increased rate of sawing during the war years, fairly abundant supplies of seasoned sawdust have now accumulated. The change from sodium arsenite to sodium fluosilicate has been very helpful because during the four years that sodium fluosilicate has been extensively used in bait no single report of death of livestock from eating sodium fluosilicate bait has been received. Previous to the use of sodium fluosilicate in bait, many farmers, and indeed whole communities, had feared to use bait because of the well-known losses of livestock that had resulted from consuming bait containing arsenic that had been carelessly handled or spread.

During the war years, millrun bran became increasingly scarce and proved substitutes or extenders were equally scarce and expensive. It is difficult to visualize the supply situation in the immediate years ahead for the ingredients that grasshoppers like to feed upon are all used in human or in livestock food. The pressing need is for an agricultural by-product that is abundant, cheap, and available in the amount and form needed for immediate shipment or storage. Industrial research might profitably turn its attention to developing a bait substance meeting these qualifications, to fortifying such a material with a substance that would actually attract grasshoppers, and to improving the speed and completeness of kill of the toxic ingredient.

During recent years, power bait mixers have been developed that will thoroughly mix bait at a fraction of the labor cost required to mix it imperfectly by hand, and there are now in use power bait spreaders a single unit of which will in a day scatter bait uniformly over an area that would require the services of twenty men broadcasting by hand. Two or three of these spreaders owned by a county and lent or rented to farmers would, in the majority of counties, assure adequate protection from grasshoppers. Large operators or groups of small farm operators could well afford to own a power spreader. In many states where grasshopper control is an annual or nearly annual problem, a bait spreader is a piece of equipment as essential to successful crop production as a cultivator or a mowing machine.

Many thousands of traction or trailer bait spreaders are in use by farmers throughout the United States. The traction spreader is constructed from the rear-end portion of the chassis of an old automobile. It has a distribution width of from 20 to 30 feet and is a very practical piece of equipment. Its chief disadvantages are that it places undue wear and strain on the vehicle used to pull it and that operations are slowed down by the time consumed in transferring the bait from the pulling vehicle to the hopper of the bait spreader.

During the period 1940 to 1946, the United States Department of Agriculture developed, built, and demonstrated two different types of mechanical bait mixers and two types of mechanical bait spreaders. These machines have been duplicated by counties and individuals and many are in extensive use today. The USDA Continuous Mixer, powered by a gasoline or an electric motor, is compact but very efficient and its labor requirement is small in proportion to its bait output. It will thoroughly mix 18 tons of bait per hour, and therefore is suitable for large-scale operations.

The USDA Batch Mixer was designed to fill the needs of the average county. It also is powered by a gasoline or an electric motor, and has a bait output of approximately 20 tons per eight-hour day. It is very adaptable for average county usage for it can be operated efficiently by one man for small daily requirements, or increased to capacity by the addition of more men in the labor crew.

The USDA Blower Spreader is powered by a gasoline motor and has a bait distribution width of from 60 to 70 feet. It is free of the disadvantages pertinent to the trailer spreader for it is mounted at the rear end of the bed of a truck which also hauls all of the bait necessary for an average day's operation.

The USDA Bait Broadcaster has been developed to fill the need for a simpler and more economical spreader than the Blower Spreader, but it has the same desirable features. The width of spread of the Broadcaster is about 40 feet.

Plans and specifications for any of the machines described herein are available upon application to the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, Washington 25, D. C.

Control varies considerably with the species of grasshopper against which it is directed. For example, control of the lesser migratory grasshopper must be directed against field-wide infestations in grain, in stubble fields, alfalfa, other crops, and idle lands. In the case of the differential grasshopper or the two-striped grasshopper, it is frequently possible to control the infestation by systematically baiting the field margins, where they hatch, before the nymphs migrate from the margins to the fields. The red-legged grasshopper is chiefly a pest in alfalfa fields where baiting has to be done in competition with a succulent crop that grasshoppers prefer. Control of the plains migratory grasshopper and of the clear-winged grasshopper is economical and particularly successful because of the habit of these species in congregating to lay eggs. By baiting the nymphs when they appear on the egg beds, only a fraction of the bait is required to control the infestation compared with the amount that would be needed to obtain partial control after the nymphs had grown and scattered to vastly wider areas.

Farmers Can Help

IT is clearly recognized by entomologists that farming practices which in themselves hold grasshopper populations at a low point should

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AGRICULTURAL CHEMICALS

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ACCOMPLISHMENTS IN GRASSHOPPER CONTROL IN THE UNITED STATES
1936-1945, incl.

Year	Tons of Bait Dry Weight, Used	Number of Acres Baited	Number of Acres Protected	Number of Farmers Using Bait	Value of Crops Saved	Value of Crops Lost
1936	26,997	5,399,400	*	*	$25,817,848	$102,029,061
1937	71,560	20,512,397	*	*	102,288,178	65,836,215
1938	135,984	30,894,496	59,424,984	417,385	176,442,672	83,841,727
1939	161,614	30,454,038	56,841,755	235,480	128,483,225	48,811,430
1940	61,569	12,172,682	19,590,790	99,348	44,568,833	24,087,117
1941	20,726	6,576,863	12,283,413	55,991	35,583,136	23,822,713
1942	17,838	6,231,303	8,206,862	49,282	29,307,683	14,016,475
1943	4,804	1,274,860	2,731,101	20,869	6,891,461	13,217,884
1944	11,206	2,188,929	4,751,462	26,238	22,712,485	13,486,060
1945	13,691	2,268,197	6,046,905	26,146	29,708,832	12,671,604
TOTALS	525,989	117,973,165	170,077,272	1,314,621	$601,804,353	$401,820,286

be followed more generally. Practices such as the elimination of breeding areas (weedy fence rows, roadsides, and waste lands), the planting of crops having some degree of tolerance to grasshopper feeding, the rotation of crops, and the plowing or cultivation of egg-infested soil before eggs hatch in the spring, discourage grasshopper increase. Unfortunately, few farmers consistently follow practices which discourage grasshopper survival and when their crops are attacked have to resort to the use of bait to protect them. Also, many soil conservation practices are not compatible with the best cultivation practices in some areas for controlling grasshoppers.

Grasshopper eggs are laid in the soil, and hatch in the spring or summer when accumulated temperatures are sufficient to complete their incubation. A factor limiting the completely effective use of grasshopper bait is the irregularity with which eggs hatch, especially in succulent or in irrigated fields. Sufficient grasshoppers may have hatched to necessitate the spreading of bait to protect the crop, after which others will hatch requiring additional or repeated baitings. This irregular hatch greatly increases the amount of bait required to bring a given field infestation under control, and baffles the farmer for he is likely to conclude that, when he finds live grasshoppers after he has thoroguhly baited his field once, his work has been ineffectual.

It must be remembered that where grasshopper bait is spread, it is nearly always in competition with succulent plants on which grasshoppers are feeding. It is little wonder that, under all of these adverse circumstances, a single baiting frequently fails to reduce completely an infestation of grasshoppers, but the evidence is conclusive that, with all of its shortcomings, grasshopper bait has been spectacularly successful. In support of this conclusion, a brief summary of accomplishment by all of the cooperating agencies during the ten-year period 1936-1945 is presented in the table accompanying this article.

Control of grasshoppers is not easy, but under most conditions crops are being economically protected by the timely use of bait. Losses being sustained annually could be minimized if farmers baited more generally on a community basis and if control were generally undertaken against infestations that do not cause heavy damage but which, in the aggregate, destroy crops valued at millions of dollars. Greater emphasis should be placed upon controlling grasshoppers by farming and cropping practices.

Federal and State research agencies are constantly working to improve grasshopper bait and it might be profitable for industrial research to turn its attention to developing an agricultural by-product which would be economical and in abundant supply that could be used as bait; to finding a substance which when added to bait would make it attractive to grasshoppers; and to finding a toxic ingredient that would improve the speed and completeness of kill.

Whether the generally accepted use of poison bait for the control of grasshoppers will be replaced partially or wholly by other, outstandingly better, methods which may be discovered by the research agencies is dependent upon the economy and practicability of the newer method.

Am. Cyanamid Consolidates

American Cyanamid Co., New York, has announced consolidation of business with its subsidiary, American Cyanamid and Chemical Corporation, effective July 31. This action is in line with the general plan for the simplification of the company's corporate structure, a company spokesman said, and henceforth the business of the subsidiary will be operated as the Industrial Chemicals Division of American Cyanamid Co. Under the new name, the former subsidiary will handle the sale of insecticides and gypsum products as well as a wide variety of other chemical products.

•

Dr. Brimley Dies

Dr. Clement S. Brimley, entomologist with the North Carolina State Department of Agriculture, died of a heart attack on July 23. He was 82 years of age at the time of his death. Dr. Brimley was widely recognized as an authority on reptiles, birds, and fishes as well as having a thorough knowledge of insects. He was born in Great Linford, Buckingham County, England, and came to the United States at the age of 17.

•

Insecticides to Argentina

The Argentine govement has authorized an appropriation of nine million dollars for the purchase of insecticides and distributing equipment in an effort to control an invasion of locusts in that country, the Department of Commerce announces. Agricultural crops, particularly fruit, and the cattle industry are endangered by the infestation. The threatened crops represent an income of about a billion dollars, it is estimated.

•

Bronson Enters Business

Arthur H. Bronson, formerly of U. S. Rubber Company has entered business for himself in Van Nuys, California. The new firm, Agricultural Pest Control Company, will specialize in the control of weeds, insects, plant diseases and rodents in the agricultural field. The company will also represent manufacturers and producers of agricultural chemicals on the coast. The company is located at 13900 Ventura Boulevard.

TREE WOUND DRESSINGS

(*Continued from Page 28*)

lous seemed thin and abnormal and Occasionally, a patent describing a tree wound dressing appeared in the older patent literature. One such (14) called for the use of a composition consisting of a fungicide, like mercuric cyanide, and a solution of a condensation product of furfural and cresol in an organic solvent containing furfural.

The newer technical and patent literature describes several more recently developed tree wound dressings. Especially interesting are the two preparations found most promising as a result of the extensive investigations reported by Cooley.(2) The first of these, Dressing No. 540, containing a disinfectant, was made according to the following formula:

	Parts
Rosin (H or I grade)	7
Sardine oil	3
Copper soap	3

A comparison of effects on callous behavior in apple tree wounds revealed that the average killing was greater with this dressing than with any other dressing tested. Even though Dressing No. 540 had good covering properties and protected the wound from drying, there was still more killing than where no protection was given, as in the untreated (control) wounds.

Far better results were obtained with the second preparation called Dressing No. 541 and made by heating the following together:

	Parts
Rosin	8
Sardine oil	3

This wax-type dressing gave better healing in general than white lead-linseed oil paint or dressing No. 540, but shellac gave more callous formation. Because it gave better results than any other compound tested, Dressing No. 541 was recommended where a dressing having good covering properties to prevent cracking and water entering the wound is desired. This dressing is also advocated when protection from the wooly apple aphid is required.

ANOTHER interesting and revealing comparison of treatments for tree wounds was reported a few years earlier by Thomas.(15) In his investigations bordeaux paste, creosote, linseed oil paint, coal tar, grafting wax, heavy petroleum jelly, bitumen emulsion and a mixture of glycerine and mercuric salts were compared as coatings for tree wounds to overcome infection by *Polystictus versicolor*, the fungus causing white rot. He found that the last two treatments gave the best results. However, when the bitumen emulsion was used on terminal wounds of healthy non-infected limbs, the wounds tended to exude sap which collected under the coating. The glycerine-mercury salt mixture proved most effective; two applications of the preparation at twenty one-day intervals controlled the worst cases of infection. This mixture was prepared by heating 3 quarts of glycerine and 1 quart of water to 170° F., adding 0.25 ounce of mercuric cyanide and then 0.25 ounce of mercuric chloride.

In passing, it is interesting to note that an identical glycerine-mercury mixture has been recommended (16) as a sterilizing solution or disinfectant for all tools used and all cuts and wounds made in excising cankers to control fire blight in apple and pear trees.

Other variations in tree wound dressings have been described in several patents. In one instance,(17) a composition for sealing the wounds of plants employs isobutylene in conjunction with brown coal tar pitch or in a combination of tetrahydronaphthalene, paraffin oil and wool grease. In another interesting patent,(18) it is advocated that oleic acid, its salts or derivatives or preparations containing such substances be used to hasten wound healing in plants. A second patent,(19) granted to the same inventors, made similar recommendations and claims for ricinoleic acid and its compounds.

One tree paint recently placed on the market is noteworthy in that it is claimed to help heal wounds in about two-thirds of the time normally required. According to the published comment (20) on this product, it is made of plasticized asphalts, resin and lanolin, plus fungicidal preventives consisting of pinene, bornyl acetate and sylvestrenes.

The possibilities of using plant hormones or growth-regulator substances in tree wound treatments have not been over-looked by investigators. Although some indicative work has been done in both this country and abroad ,the results are far from conclusive. Shear's (13) experiments, which involved treating wounds with growth-promoting substances, indicated that callous formation may be accelerated by such materials. However, Tilford (3) reported that lanolin containing indolebutyric acid did not stimulate callous formation.

EUROPEAN workers (21) have also studied the influence of growth substances on wound-tissue formation. They observed that regeneration of wounded tissue from cuts made on branches of cherry, plum, apple and pear trees was greatly accelerated by treatment with plant hormone-containing preparations. Rapid callous formation was observed not only on the bark but also over the entire wounded surface. When two rings were made on the same branch 2 to 5 centimeters apart, the callous formation of the lower wound was more favorably influenced by the growth substances. The results were considered to be of practical significance for the treatment of plant wounds.

An interesting commentary on the use of such substances is the fact that a patent (22) has been granted recently covering the synthesis of hormones active in stimulating the process of healing wounds in plant tissues.

It is obvious that, although much work has been done and many materials are available, the ideal tree wound dressing has yet to be developed. At the present pace of research, however, who can say when a product will be discovered which will do for tree injury treatments what DDT has done for insecticides and 2,4-D for weed-killers.

(*Continued on Next Page*)

Bibliography

(1) Marshall, R. P.: 'Care of Damaged Shade Trees," U. S. Dept. Agri., Farmers' Bull. 1896, May 1942.
(2) Cooley, J. S.: "Wound Dressings on Apple Trees," U. S. Dept. Agri., Circ. 656, Aug. 1942.
(3) Tilford, P. E.: Nat'l. Shade Tree Conf., Proc. 16:41, 1940.
(4) Marshall, R. P.: "Relation of Season of Wounding and Shellacking to Callers Formation in Tree Wounds," U. S. Dept. Agric.
(5) Weiss, F. & Baumhofer, L. G.: "Culture, Diseases, and Pests of the Box Tree," U. S. Dept. Agric. Farmers Bull. 1855, Nov. 1940.
(6) Martin, J. F. & Gravatt, G. F.: "Treatment of White Pines Infected with Blister Rust," U. S. Dept. Agric., Farmers' Bull. 1885, Jan. 1942.
(7) Walter, J. M. & Mook, P. V.: Phytopathology 31.32, 1941.
(8) Le Sueur, A. D.: Arborist's News 3: No. 2, 1, 1938.
(9) Zeller, S. M.: "Cankers of Apple & Pear in Oregon and their Control," Oreg. Agr. Expt. Sta. Circ. 73, 1926.
(10) York, H. H.: Arboretum Bull. Associates Morris Arboretum 3:73, 1941.
(11) Yokum, L. J.: "Plant Growth," Lancaster, Cattell, 1945, pp. 63-4.
(12) Bennett, H.: "Chemical Formulary," New York, Chem. Publ. Co., Vol. III p. 116, Vol. VII p. 119.
(13) Shear, G. M.: Proc. Am. Soc. Hort. Sci.; 34:286, 1937.
(14) Melhus, I. E.: U. S. Pat. 1,785,-641, 1930.
(15) Thomas, P. H.: Tasmanian J. Agr. 8:180, 1937.
(16) Utah State Agricultural College: (through) Utah Farmer, March 25, 1941, p. 3.
(17) Muller-Cunradi, M. et al: U. S. Pat. 2,180,081, 1939.
(18) Friedrich, H. & Wehnelt, B.: Ger. Pat. 726,202, 1942.
(19) Friedrich, H. & Wehnelt, B.: Ger. Pat. 729, 080, 1942.
(20) Anon.: Chem. & Eng. News, 24:680, 1946.
(21) Jakes, E. & Hexnerova, H.: Gartenbauwiss. 13:83, 1939 (through) Chem. Abstr. 33:5889, 1939.
(22) English, J., Jr., Bonner, J & Haagen-Smit, A.J.: U. S. Pat. 2,391,824, 1945.

Coal Tar Experiments

A research project is under way at Delaware Agricultural Experiment Station, Newark, Dela., which deals with the testing of organic chemicals derived from coal tar for use as fungicides, bactericides, growth promoters, weed killers, food and fabric preservatives, etc. The program is under auspices of the Koppers Coal Company.

By the end of 1945 more than 800 compounds derived from coal tar had been tested for their fungicidal and bactericidal values. The major objective of the laboratory study, it was explained in the Station's annual report for 1945, is to determine if there is any relation between chemical structure and fungicidal and bactericidal activity. "Some interesting and valuable data have been obtained in this respect," states the report, without further elaboration. Several compounds were undergoing field tests as fungicides and two compounds were being given field tests as weed killers.

Delaware station also reports on early results of research in the value of various synthetic chemicals as seed protectants and as protective fungicides on vegetables and fruit crops. These have been under way since 1944.

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Applying DDT in Barns

Oklahoma Agricultural Experiment Station, Stillwater, Okla., released in July a mimeographed circular, M-156 giving instructions for applying DDT sprays in barns. To get good results two or three sprays each season are recommended. Warning was also issued that field use of new chemicals for killing brush and weeds "should be undertaken with caution." Further study is needed before recommendations can be made, a press bulletin stated. It was announced also in July that a publication is in preparation dealing with the use of disinfectants for treating cotton seed to control insects and bacterial diseases causing boll rots.

COPPER FUNGICIDES

(*Continued from Page 24*)

gundy mixture, copper ammonium silicate (Coposil), copper aluminum silicate (Z-O), copper phosphate, copper acetate, copper oxalate, ammoniacal copper carbonate, etc. However, their present-day use is quite limited.

It is readily apparent that the control of many plant diseases and the protection of agricultural crops is greatly dependent on the major copper fungicides available. During recent years, there has been a considerable development in the field of synthetic organic fungicides, and many of these newer compounds are showing promise. However, it has been predicted that such compounds will be used individually for the control of specific diseases on given crops, and that they will not experience the wide range of application obtained with copper fungicides. Furthermore, the traditional use and experience with copper and the prospects of additional compounds, appear to assure a favorable future outlook for this well-known group of fungicides.★★

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Write to your dust mixer for prices and any further information desired.

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MARKET REPORT

(*Continued from Page 45*)

Superphosphates are on the encouraging list, with production climbing. April, 1946 saw a new high output totaling 5,000 tons more than the previous record of last October. The April output (695,104 tons basis: 18% P_2O_5) was 7 per cent ahead of that of March, and 21 per cent greater than that of April, 1945. But with an exceptionally high rate of consumption, the added production failed to prevent stocks from reaching a relatively low figure as of April 30. The latter figure was 425,347 tons which was 36 per cent below the inventories of a year ago. Exports of normal superphosphate in April (12,252 tons) were slightly below the monthly average for the first quarter of this year.

The outlook for phosphate rock in 1946 appears favorable, with shipments totaling 4,000,000 tons expected. However, this is not the entire story, for many countries do not possess facilities for processing rock in such quantities, leaving a large deficit for soluble phosphates next year. American exports of phosphate rock in April declined to 45,130 tons.

Although potash is still under allocation, the distribution pattern of last year is expected to be followed, with approximately the same quantity available for agriculture as during the past year. Potash deliveries in April this year were 79,778 tons of K_2O as compared to 72,961 tons in April, 1945. A 4 per cent increase was noted during the first 10 months of the 1945-46 year over the same period of the previous year.

Germany, which in years past provided a large percentage of the world's potash supply, may again become productive next year; a factor, if brought about, which will probably mean that some exportable surplus may be destined for the United States under the program of the Combined Food Board.

New Trade Marks . . .

Application has recently been made to the U. S. Patent Office for registration of the following trade-marks for products in the agricultural chemical field, and the marks listed were published in June and July issues of the OFFICIAL GAZETTE. The Patent Office requires that notice of any opposition to registration of a trade-mark be filed within thirty days of publication in the GAZETTE, accompanied by a fee of ten dollars.

Trade Mark Applications

AEROSECT — In bold capital letters for insecticides. Filed October 2, 1945, by Pennsylvania Engineering Co., Philadelphia. Claims use since September 11, 1945.

DISENE — Bold capital letters, for insecticides. Filed by Chemical Service Co., Baltimore. October 11, 1945. Claims use since October, 1937.

STRATOSOL — In arched capital letters, for insecticides. Filed Sept. 11, 1945 by Stratosol Corp., New York. Claims use since Aug. 2, 1945.

"BANG" — In bold capitals, for insecticides. Filed Sept. 22, 1945 by York Pharmacal Co., St. Louis. Claims use since Sept. 5, 1945.

INTOXIN — In capital letters, for insect spray. Filed Sept. 25, 1945, by Ultra Chemical Works, Inc., Paterson, N. J. Claims use since May, 1937.

"ANTI-FLY" — In bold capitals, for insect spray. Filed June 18, 1945 by Brunswig Drug Co., Los Angeles. Claims use since Sept., 1927.

PESTROY—In capital letters, for pest inhibiting compositions. Filed Feb. 4, 1946, by Sherwin-Williams Co., Cleveland, O. Claims use since September 4, 1919.

FLY-CIDE—In capital letters, for insecticides. Filed Feb. 8, 1945, by Magnolia Chemical Co., Jackson, Miss. Claims use since Jan. 1, 1932.

ANTURAT—In heavy capital letters. For rodenticide. Filed Mar. 25, 1946, by Dr. Hess & Clark, Inc., Ashland, Ohio. Claims use since Feb. 22, 1946.

ENTOSPRAY—In capital letters, for DDT concentrate solution. Filed Feb. 19, 1946, by Lederle Laboratories, Inc., New York. Claims use since Jan. 21, 1946.

AERO DEFOLIANT—In upper and lower case, with word "Aero" above second word. For chemical preparation containing calcium cyanamide used to remove foliage from plants. Filed Oct. 12, 1944, by American Cyanamid Co., New York. Claims use since Aug. 12, 1944.

RAY-O-SAN—In capital letters. For insecticides. Filed Nov. 23, 1945, by Peter Causo, doing business as Causo Trading Co., New York. Claims use since Nov. 15, 1945.

RENTOKIL—In capital letters, for insect destroying and repelling preparations. Filed June 19, 1945 by Rentokil Ltd., London, England. Claims use since 1924.

GAMMEXANE—In capital letters, for insecticides and chemical substances having insecticidal properties. Filed July 27, 1945, by Imperial Chemical Industries, Ltd., Slough, England. Claims use since Feb. 23, 1945.

W. M. C.—In capital letters, for medicinal preparation for treating mange and conditioning the skin and hair of dogs, for relieving insect bites and stings and for treating sorehead on poultry. Filed Oct. 2, 1945, by King A. Woodburn, doing business as Woodburn Remedies, Jacksonville, Fla. Claims use since Sept. 25, 1945.

KAL-ZOO—In hyphenated capital letters, for insecticides. Filed Oct. 29, 1945, by Chandler R. Parsons, doing business as Parsons Chemical Works, Grand Ledge, Mich. Claims use since Feb. 20, 1945.

HERETOX—In capital letters for household insecticide and for farm and industrial insecticide. Filed December 15, 1945. Claims use since Sept. 18, 1945.

BUG-ZOOKA—White letters on black background, for insecticides and disinfectants, in solid, powder, and liquid form. Filed Feb. 1, 1946, by Daniel J. Klein, doing business as Allied Exterminating Co., New York. Claims use since Jan. 15, 1945.

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Trade Marks Granted

419,757. INSECTICIDE. E. I. du Pont de Nemours & Co., Wilmington, Del. Filed August 21, 1945.

421,392. INSECTICIDES. Chemurgic Corp., Richmond, Calif. Filed Nov. 2, 1945.

421,580. INSECTICIDES, for agricultural and household purposes. Chipman Chemical Co., Bound Brook, N. J. Filed Oct. 20, 1945.

421,592. PARASITICIDES — NAMELY, INSECTICIDES, FUNGICIDES AND GERMICIDES. California Spray-Chemical Corp., Wilmington, Del., and Richmond, Calif. Filed Oct. 30, 1945.

421,593. INSECTICIDES. Organized Distributors Inc., Oakland, Calif. Filed March 12, 1946.

421,600. AGRICULTURAL AND HORTICULTURAL FUNGICIDES. Filed Nov. 8, 1945, by DuPont Semesan Co., Wilmington, Del., assignor to E. I. du Pont de Nemours & Co., Wilmington.

421,948. Finely divided Fuller's Earth used as an insecticide carrier or diluent. Attapulgus Clay Co., Philadelphia. Filed April 14, 1945.

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Monsanto Makes Awards

Four industrial scientists have been awarded leaves of absence from Monsanto Chemical Co., St. Louis, for an academic year of study at universities of their choice. The new program, announced recently by Monsanto, provides full salary for the scientists during the year of study.

The first four to receive these academic awards are Louis P. Wenzell, Jr., St. Louis; Colver P. Dyer, Winchester, Mass.; C. J. Stehman, Dayton, Ohio, and Eli Perry of Springfield, Mass.

Industry Patents

The following patents have recently been issued by the U. S. Patent Office on products and devices in the agricultural chemical field. Copies of the patents may be obtained at 25c each by addressing the U. S. Patent Office, Washington 25, D. C.

No. 2,400,863. ALGAECIDE. Patented May 21, 1946 by Max Gelfand, Dallas, Tex. Algaecide comprising a mixture of a water soluble inorganic copper salt and an inhibitor of reaction between said copper salt and an alkaline aqueous solution comprising a water soluble salt of an aliphatic hydroxy acid, the acid radical of the copper salt being stronger than that of the aliphatic hydroxy acid salt.

* * *

No. 2,402,896. INSECTICIDE. Patent granted June 25, 1946 to Theodore W. Kerr, Jr., Seymour, Conn., assignor to United States Rubber Co. New York. An insecticidal composition containing 2,2-bis(p-chlorophenyl)-1, 1, 1-trichlorethane and an oily distillation product of the condensation product of monochlorobenzene with ethylene dichloride.

* * *

No. 2,403,495. INSECTICIDE. Patent granted July 9, 1945 to Charles Verne Bowen, Bethesda, Md., assignor to the United States of America, as represented by the Secretary of Agriculture. A method of controlling insects comprising applying 1,4-diphenylthiosemicarbazide to the habitat of the insects.

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Velsicol Promtes Two

Frank C. Peters has been named by Velsicol Corporation of Chicago to a position on the company's eastern sales staff, with headquarters in New York. Mr. Peters spent a number of years in allied fields before entering the U. S. Navy from which he was recently discharged. He is the son of Ned Peters, former president of National Paint, Varnish and Lacquer Association, and a graduate of Columbia University.

Velsicol also announces the appointment of Noble L. Mooneyham as western district sales manager. Mr. Mooneyham has been with Velsicol since 1935, and has served in an executive capacity since 1938.

•

New Pennsalt Unit

Pennsylvania Salt Company announces plans for building at Portland, Oregon, its third unit for producing technical DDT. It will be installed in conjunction with the new million dollar caustic soda and chlorine plant now under construction in Portland.

The new plant is being built to supply the needs for DDT throughout the western part of the United States, and in the Pacific export market. It will make the insecticide immediately available for western growers.

2, 4-D

★

2,4 Dichlorophenoxyacetic Acid

and

Sodium Salt

★

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New Books . . .

DDT The Synthetic Insecticide, by T. F. West and G. A. Campbell. 1946, pp. i-xii, 1-301, pls. I-XIII. Chapman and Hall Ltd., 37 Essex Street, London, W.C. 2, England. 21s net.

THE large amount of information on the chemical DDT, its formulations and effectiveness in killing insects, included in this book makes it one which will be welcomed by all those concerned with DDT, its insecticidal properties, and possible usefulness. The account of the early development of the insecticidal properties of DDT and the work done on it in England and elsewhere in Europe should be of interest and help to many in the United States who even yet consider that DDT was a war-time development of our country. The discussion in prologue "History and Development," the summary of "The Basle Researches," and the "Manufacture and Chemistry" presented in chapters I and II make it clear that discovery of the insecticidal properties of DDT was the result of planned, unhurried research and that the phenomenal development resulted from determination and acceptance of its value as a war-time tool.

For the most part the book is a summary of published information. Some sections, notably Chapters V ("DDT in Paints and Miscellaneous Materials") and VI ("DDT in Textiles and Paper"), however, include considerable information previously unpublished.

Part two, which deals with the insecticidal effectiveness of DDT, is divided into seven chapters, each dealing with the special field. One of the most complicated is the chapter (XII) dealing with "DDT Against Plant Pests." Here the material is grouped under common names of insects or groups of insects which are arranged in alphabetical order. Careful reference to technical names which are listed in the subject index makes the data available to the entomologist. The producer of insecticides can, without undue work, also use the summary to appraise fields of possible usefulness indicated in summary of research results.

Technical workers will recognize that the book is basically a summary survey of research done and that results reported are not recommendations for general use. The authors bring this out in the epilogue which they characterize as follows: "At the end of the book we have attempted to step through the 'looking glass' which separates today's academic knowledge from tomorrow's practical applications with all the great expectations, the difficulties and disappointments." After referring to some other new materials, they predict the insecticidal future of DDT as follows: "At the same time we feel that DDT has probably come to stay for a long time and is worthy of prolonged experimentation in many fields because, (1) it is a relatively cheap chemical, (2) it is white in color, possesses little odor and is nontoxic to warm-blooded animals at working concentrations, (3) it is effective against an amazingly wide range of insects, (4) it is readily soluble in the majority of organic solvents, and its chemical and physical properties are such that it can be presented in a wide variety of formulations to combat pests of varying types."

The Author's Preface is dated November, 1945, and the literature cited includes practically no references to the numerous processes or mimeographed documents issued in the United States. This very useful summary and survey of information does not, therefore, include all the material now available to specialists and field workers about DDT, its insecticidal usefulness and shortcomings. Where research is active this is no fault, as no book can be complete. Summarizing what is known benefits all workers. This book is such a contribution.

—*S. A. Rohwer.*

Advertisers' Index

Accurate Tool Co. 54
American Cyanamid & Chemical Corp. .....July
Andrews, W. R. E., Sales Co. 58
Attapulgus Clay Co..... 3
Baird & McGuire Inc..... 38
Baker, J. T., Chemical Co. 2nd Cover
Brooklyne Chemical Works.May
Chipman Chemical Co.....June
De Ong, Dr. E. R..... 61
Derris, Inc. .....May
Dodge & Olcott, Inc..... 6
Du-La Mfg. Co.....July
Eastern Magnesia Talc Co. 56
Edco Corporation 4
Faesy & Besthoff, Inc..... 48
Gallowhur Chemical Corp. . 52
Geigy Co., Inc..... 40
Hercules Powder Co....42 & 43
Industrial Management Corp. .....May
Kolker Chemical Works... 64
Literite Co., Inc.....July
McConnon & Co..... 62
McLaughlin Gormley King Co. .....July
Merck & Co., Inc..... 10
New York Quinine & Chemical Works .....May
Niagara Sprayer & Chemical Co. 50
Orbis Products Corp.....June
Penick, S. B., & Co..... 8
Pennsylvania Salt Mfg. Co. 7
Phelps Dodge Refining Corp. .....July
Powell, John, & Co..... 12 and 4th Cover
Prentiss, R. J., & Co..3rd Cover
Reade Manufacturing Co...July
Rohm & Haas Co.....July
Tobacco By-Products & Chemical Corp. 50
United Clay Mines Corp...May
Vanderbilt, R. T., Co..... 64
Velsicol Corp..... 9
Wisconsin Alumni Research Foundation 11

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

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ONCE again, to quote a well-known advertising agency space buyer: "An advertiser can cover an entire field in one stroke at low cost through the right business papers."

This is undoubtedly true as far as it goes, but the advertiser must know also which are "the right business papers," — those which because of editorial content, reader interest and a rising circulation curve PROVE that they are the right ones.

In the field of agricultural insecticides, fungicides, weed killers, rodenticides and allied chemical specialties, for example, there is one publication which "proves" it is the "right paper" . . . and that is

AGRICULTURAL CHEMICALS

254 WEST 31st STREET **NEW YORK 1**

TALE ENDS

UNITED STATES patent No. 2,403,847 has been granted a citizen of Suspension, Alabama, for a grass and weed destroyer of non-chemical nature. The gadget is attached to the smokestack of a locomotive, and pipes downward the puffs of steam, smoke, cinders and whatever else it is that is belched forth from the engine's fiery interior, distributing the blast on weeds adjoining the railway right-of-way. Who knows? Next thing we know, railroads may mix 2,4-D with their locomotive fuel and spray the countryside with weed-killing chemicals concealed in the usual blanket of smoke.

•

Potato blight a blessing in disguise? History records one such epidemic which although causing starvation to a nation and disrupting its economy, in the end enabled many thousands of persons to find a better way of life. Ireland, in 1845 suffered the worst potato blight in its history, reducing the country's staple food to the point of extinction. Conditions thus necessitated the great immigration of Irish to the United States.

•

Press reports from Pretoria, South Africa, tell of a rather preposterous program reportedly designed to control within a five year period, the tsetse fly, carrier of sleeping sickness to man and Nagana disease to herds of cattle. The plan of attack omits all use of insecticides, according to reports. The idea is to round up wild game, which, although immune to tsetse disease, are believed to be fly-carriers. The animals will be driven into a specially-prepared reserve and a strip two miles wide will be laid waste around it on the assumption that the tsetse can't fly that far. Sounds to us like going to war without guns and minus ammunition.

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We're flattered, of course, at the many requests coming in for Volume I, Number 1 of Agricultural Chemicals. But they're all gone. Better keep your copy!